

POPULAR SCIENCE

MONTHLY

JAN. 1946
25 CENTS



SCIENCE LOOKS TO STARS AGAIN

Copyrighted material

**HERE IT IS
THE MOST USEFUL**

Here, in one great, brand-new volume is **EVERYTHING** you need to know to do **ANY** job in or around your home—repairs, alterations, improvements, and new projects.

The *Home Mechanic's Handbook*

JUST A FEW OF THE PRACTICAL JOBS FULLY DES

How to choose the right paint for every job

Figure the quantity of paint needed

Paint a house—inside and outside

Care for brushes

Refinish or "touch up" an auto

Paper a room

Put glass in windows

Replace a sash cord

Shingle or repair a roof

Screen in a porch

Tighten a loose chair, floor board, stair tread

Fix a window, door, or drawer that sticks

Fit screens, storm windows, doors

Build a chicken house, cupboard, workbench, cold-bed frame, storage cabinet

Cut, drill, grind, solder, temper, and forge metal

Measure, cut, thread, join, and assemble pipe

Fix leaks in faucets and valves

Thaw frozen pipes

Install a hot-water heater

Make a flagstone walk, a sidewalk, a wall, concrete steps, a shuffleboard

Build a brick fireplace

Install glass blocks

Install a call-bell system and rear-door system, a door circuit, or a burglar alarm

Locate a short circuit

Repair electrical equipment and appliances

YOU need this Book

• **HOME OWNERS!** It will help you repair, fix up, and redecorate.

• **FARMERS!** You'll find thousands of how-to-do-it instructions for improving your buildings.

• **REPAIR MEN!** It will help you work more efficiently, profitably.

• **BEGINNERS!** You need no previous experience to follow these step-by-step directions.

• **HOME WORKSHOP OWNERS!** You'll find thousands of new ideas, "kinks," practical projects.

• **HOBBYISTS!** You'll get a great kick out of the hundreds of "tricks of the trade," ingenious short cuts, helpful hints.

• **EX-SERVICE MEN!** You'll find it of great help in remodeling a house, a farm, a place of business.

THE
**Home
Mechanic's
Handbook***

DI BERNARDO

HAINES

ADAMS

VAN TASSEL

THOMPSON

MILLER

BAILEY

NOWAK

D VAN NOSTRAND
COMPANY INC.

815 Pages

Remarkable
Illustrations
show every job and
the use of every tool

**BIG... AUTHORITATIVE...
TREMENDOUSLY HELPFUL**

Personal Accident, Health and Hospital Insurance

Direct at Cost

FOR ALL PREFERRED RISKS, most "white collar" men between the ages of 18 and 54, this strong, 62-year-old company of 212,000 carefully chosen members offers maximum protection per dollar because of the economy of our mutual way of doing business *Direct, At Cost. Not a limited type policy.* You are protected night and day, at home or on trips...at work or at play...whether your income is affected or not. We are licensed by the Insurance Departments of New York and Canada.

Here's what you get:

Choice of plans to fit your needs

\$25 or \$50 WEEKLY for TIME LOST through injury by accidental means...payable from the first day every 30 days for as many as 104 weeks...as much as \$2,600 under the single or \$5,200 under the double plan for any one mishap. No limit to number of mishaps covered.

\$12.50 or \$25.00 WEEKLY up to 26 weeks for partial disability similarly caused.

\$5,000 or \$10,000 for LOSS OF LIFE, limbs or sight by accidental means.

\$25 WEEKLY for SICKNESS causing confining disability, payable after the first 10 days every 30 days for as many as 52 weeks...up to \$1,300 for any one confining sickness. No limit to number of separate sicknesses covered.

\$12.50 WEEKLY up to 26 weeks for non-confining total disability caused by sickness.

Up to \$290 for HOSPITALIZATION: In addition to above allowances, up to \$290 is paid direct to you for hospital room or a nurse in the home, surgery, X-ray, operating room, anaesthesia and laboratory fee, for either accidents or sickness. No conflict with Blue Cross or other group plans.

SEND NO MONEY now, but do mail the coupon below for the FACTS booklet of interesting information and an easy-to-complete blank for applying. If your application were accepted at this time, only \$2 would cover the full cost of the single plan of accident protection until next June; currently \$2.50 quarterly thereafter—moderately more for double accident benefits, health or hospitalization.

The Commercial Travelers

MUTUAL ACCIDENT ASSOCIATION

H. E. Trevett, Sec'y. UTICA, N.Y. Founded in 1883

The Commercial Travelers
H. E. Trevett, Secretary, Utica 2, N.Y.

Send, without obligation, your free "Facts" booklet and an easy-to-complete application blank.

Name.....

Address

Age..... Occupation.....
[18 to 54] PS-5 No Solicitors Will Call

POPULAR SCIENCE MONTHLY

CONTENTS — JAN., 1946 (CONTINUED)

Mirrored Case Displays Models.....	157
Pencil Tube Forms Plane Bearing.....	157
Old-Time Engine Design.....	161
Shooting Star—Speed King.....	166
Servicemen Seek Craftwork Prizes.....	168
Two Safe Sleds for Baby.....	169
Support for Sagging Joist.....	169
Flying Boxcar—Future Freighter.....	170
Bud Vase Made from Bulb.....	202
Filter for Warm-Air Register.....	202
California Stud Saves Lumber.....	203
Chest Affords Tool-Storage Space.....	203
Lap-Joining a Stair Stringer.....	203
A Modelmaker Builds His Dream Boat...	205

RADIO & ELECTRICITY

Wire Recording.....	125
News in Electronics.....	188
Solenoid Governs Welding Generator....	189
Snap Action for Contacts.....	189
Cigar Box Tesla Coil.....	190

DEPARTMENTS

Editorial Memo.....	6
Readers Say	16
New Tools.....	98
Modern Living	136
Home Owners.....	146
What's Your Ingenuity Quotient?.....	151
Keeping the Home Shipshape.....	158
Craftsmen at Work.....	160
For Easier Farming.....	195
Table Tricks.....	204



NEW B. F. GOODRICH PASSENGER TIRE

New B. F. Goodrich synthetic TIRE THAT OUTWEARS PREWAR TIRES!

"**A**MIRACLE," some have called it! Few believed that a tire could ever be made of synthetic rubber that would actually out-distance those made of prewar natural rubber. Yet here it is, the new B. F. Goodrich Silvertown. And here are some of the reasons for its longer-than-prewar mileage:

New, better rubber

A new rubber, so superior that for a long time it was a closely guarded military secret, was developed by B. F. Goodrich. Tires made with this rubber wear longer, run cooler. They have greater resistance to cracking—actually are more resistant to bruising and damage from accidents. But rubber is only one reason why the new B. F. Goodrich Silvertown outwears prewar tires.

New road-level tread

In the picture above, note how the tread is flatter—puts more rubber on the road. This means that

more rubber shares the wear, spreads it evenly over the whole tread surface. No more worn-out-in-the-middle treads. The result: more mileage, better traction, more skid-resistance and greater safety.

The tire body is more rugged, too. B. F. Goodrich developed a stronger cord for this tire. And more cords are used than in prewar tires. Another feature that means more miles, greater safety for you.

Nearly 17 million test miles

Over 2,000 tests have been made with this new tire. Taxi fleets, state police cars, and the B. F. Goodrich test fleet have rolled up nearly 17 million miles under all kinds of driving conditions. The new B. F. Goodrich Silvertown gives longer tread wear . . . actually outdistances prewar tires.

3 years' EXTRA experience

The first B. F. Goodrich tires containing synthetic rubber were

sold to American motorists 18 months before Pearl Harbor. That was three full years before any other tire manufacturer . . . three years during which B. F. Goodrich has been piling up extra synthetic rubber tire experience.

This three-year head start is another reason why you can count on extra mileage . . . extra safety . . . extra value from the new B. F. Goodrich Silvertown.

Supplies are still limited, of course, but we hope to have much larger quantities in the hands of most dealers within the next few months. *The B. F. Goodrich Company, Akron, Ohio.*

More miles with
B.F. Goodrich
FIRST IN RUBBER



NEW B. F. GOODRICH PASSENGER TIRE

New B. F. Goodrich synthetic TIRE THAT OUTWEARS PREWAR TIRES!

"**A**MIRACLE," some have called it! Few believed that a tire could ever be made of synthetic rubber that would actually out-distance those made of prewar natural rubber. Yet here it is, the new B. F. Goodrich Silvertown. And here are some of the reasons for its longer-than-prewar mileage:

New, better rubber

A new rubber, so superior that for a long time it was a closely guarded military secret, was developed by B. F. Goodrich. Tires made with this rubber wear longer, run cooler. They have greater resistance to cracking—actually are more resistant to bruising and damage from accidents. But rubber is only one reason why the new B. F. Goodrich Silvertown outwears prewar tires.

New road-level tread

In the picture above, note how the tread is flatter—puts more rubber on the road. This means that

more rubber shares the wear, spreads it evenly over the whole tread surface. No more worn-out-in-the-middle treads. The result: more mileage, better traction, more skid-resistance and greater safety.

The tire body is more rugged, too. B. F. Goodrich developed a stronger cord for this tire. And more cords are used than in prewar tires. Another feature that means more miles, greater safety for you.

Nearly 17 million test miles

Over 2,000 tests have been made with this new tire. Taxi fleets, state police cars, and the B. F. Goodrich test fleet have rolled up nearly 17 million miles under all kinds of driving conditions. The new B. F. Goodrich Silvertown gives longer tread wear... actually outdistances prewar tires.

3 years' EXTRA experience

The first B. F. Goodrich tires containing synthetic rubber were

sold to American motorists 18 months before Pearl Harbor. That was three full years before any other tire manufacturer... three years during which B. F. Goodrich has been piling up extra synthetic rubber tire experience.

This three-year head start is another reason why you can count on extra mileage... extra safety... extra value from the new B. F. Goodrich Silvertown.

Supplies are still limited, of course, but we hope to have much larger quantities in the hands of most dealers within the next few months. *The B. F. Goodrich Company, Akron, Ohio.*

More miles with
B.F. Goodrich
FIRST IN RUBBER

Personal Accident, Health and Hospital Insurance *Direct at Cost*

FOR ALL PREFERRED RISKS, most "white collar" men between the ages of 18 and 54, this strong, 62-year-old company of 212,000 carefully chosen members offers maximum protection per dollar because of the economy of our mutual way of doing business *Direct, At Cost. Not a limited type policy.* You are protected night and day, at home or on trips...at work or at play...whether your income is affected or not. We are licensed by the Insurance Departments of New York and Canada.

Here's what you get:

Choice of plans to fit your needs

\$25 or \$50 WEEKLY for TIME LOST through injury by accidental means...payable from the first day every 30 days for as many as 104 weeks...as much as \$2,600 under the single or \$5,200 under the double plan for any one mishap. No limit to number of mishaps covered.

\$12.50 or \$25.00 WEEKLY up to 26 weeks for partial disability similarly caused.

\$5,000 or \$10,000 for LOSS OF LIFE, limbs or sight by accidental means.

\$25 WEEKLY for SICKNESS causing confining disability, payable after the first 10 days every 30 days for as many as 52 weeks...up to \$1,300 for any one confining sickness. No limit to number of separate sicknesses covered.

\$12.50 WEEKLY up to 26 weeks for non-confining total disability caused by sickness.

Up to \$290 for HOSPITALIZATION: In addition to above allowances, up to \$290 is paid direct to you for hospital room or a nurse in the home, surgery, X-ray, operating room, anaesthesia and laboratory fee, for either accidents or sickness. No conflict with Blue Cross or other group plans.

SEND NO MONEY now, but do mail the coupon below for the FACTS booklet of interesting information and an easy-to-complete blank for applying. If your application were accepted at this time, only \$2 would cover the full cost of the single plan of accident protection until next June; currently \$2.50 quarterly thereafter—moderately more for double accident benefits, health or hospitalization.

The Commercial Travelers

MUTUAL ACCIDENT ASSOCIATION

H. E. Trevett, Sec'y. UTICA, N.Y. Founded in 1883

The Commercial Travelers
H. E. Trevett, Secretary, Utica 2, N.Y.

Send, without obligation, your free "FACTS" booklet and an easy-to-complete application blank.

Name.....

Address

Age..... Occupation.....
[18 to 54] PS-5 No Solicitors Will Call

POPULAR SCIENCE MONTHLY

CONTENTS — JAN., 1946 (CONTINUED)

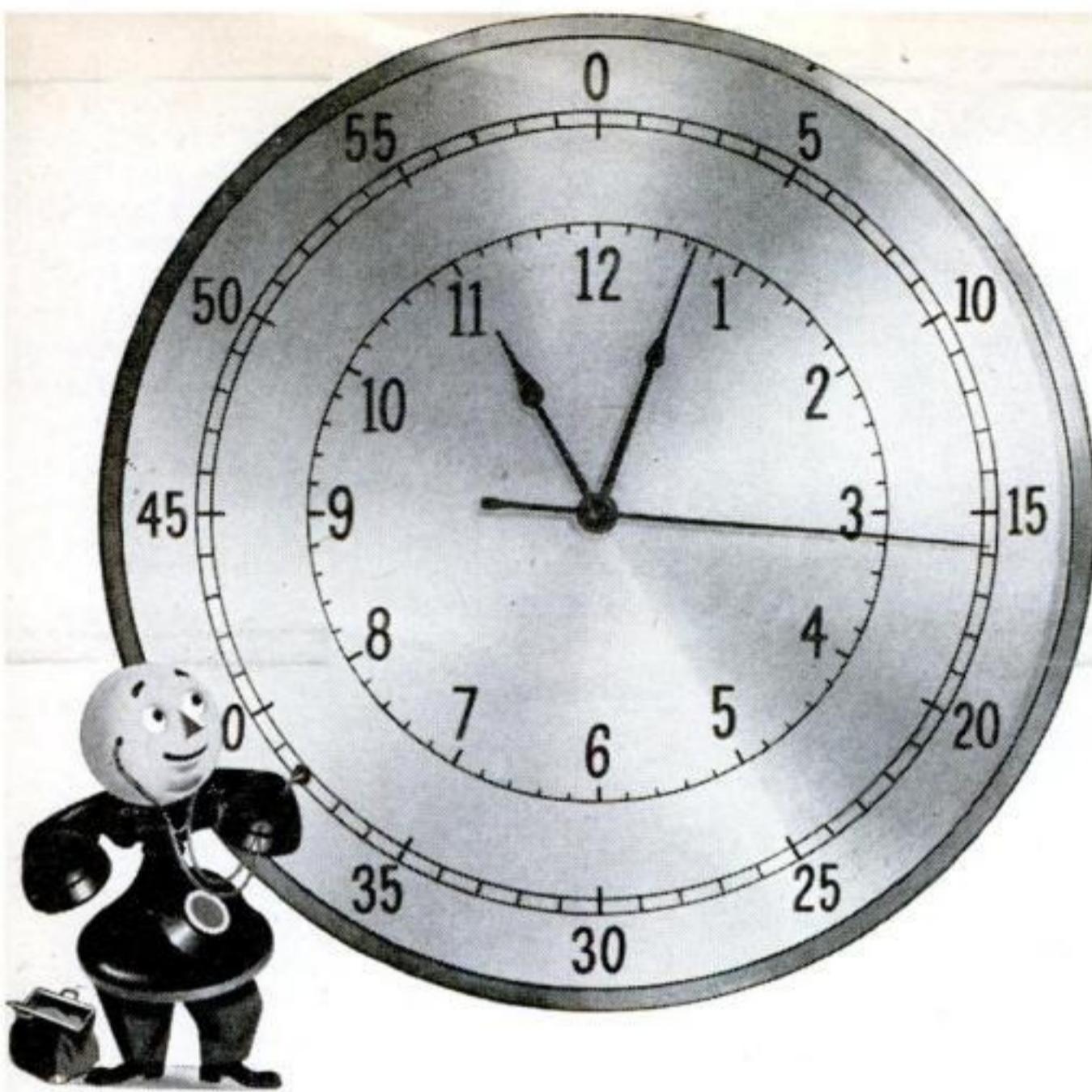
Mirrored Case Displays Models.....	157
Pencil Tube Forms Plane Bearing.....	157
Old-Time Engine Design.....	161
Shooting Star—Speed King.....	166
Servicemen Seek Craftwork Prizes.....	168
Two Safe Sleds for Baby.....	169
Support for Sagging Joist.....	169
Flying Boxcar—Future Freightier.....	170
Bud Vase Made from Bulb.....	202
Filter for Warm-Air Register.....	202
California Stud Saves Lumber.....	203
Chest Affords Tool-Storage Space.....	203
Lap-Joining a Stair Stringer.....	203
A Modelmaker Builds His Dream Boat...	205

RADIO & ELECTRICITY

Wire Recording.....	125
News in Electronics.....	188
Solenoid Governs Welding Generator....	189
Snap Action for Contacts.....	189
Cigar Box Tesla Coil.....	190

DEPARTMENTS

Editorial Memo.....	6
Readers Say	16
New Tools.....	98
Modern Living	136
Home Owners.....	146
What's Your Ingenuity Quotient?.....	151
Keeping the Home Shipshape.....	158
Craftsmen at Work.....	160
For Easier Farming.....	195
Table Tricks.....	204



Clocks with tiny crystal hearts that beat 100,000 times a second

CRYSTAL HEARTS beat time in Bell Telephone Laboratories, and serve as standards in its electronics research. Four crystal clocks, without pendulums or escapements, throb their cycles without varying by as much as a second a year.

Precise time measurements may seem a far cry from Bell System telephone research, but time is a measure of frequency, and frequency is the foundation of modern communication, whether transmission is by land lines, cable, or radio.

These clocks are electronic devices developed by Bell Laboratories, and refined over years of research. Their energy is supplied through vacuum tubes, but the accurate timing, the controlling heart of

the clock, is provided by a quartz crystal plate about the size of a postage stamp.

These plates vibrate 100,000 times a second, but their contraction and expansion is less than a hundred-thousandth of an inch. They are in sealed boxes to avoid their variation in atmospheric pressure, and temperatures are controlled to a limit as small as a hundredth of a degree.

Bell Laboratories was one of the first to explore the possibilities of quartz in electrical communication, and its researches over many years enabled it to meet the need for precise crystals when war came. The same character of research is helping to bring ever better and more economical telephone service to the American people.



BELL TELEPHONE LABORATORIES Exploring and inventing, devising and perfecting for continued improvements and economies in telephone service.

EDITORIAL MEMO

To: Reader
From: Editor

Down at the bottom of this page is what is called the "masthead." For some reason, magazine staffs are full of what seem to be fictional names. In fact, William Saroyan once had a character in a play intone the whole masthead of Time. Popular Science Monthly, too, has its share of unusual people, some of whom have matching names. You might like to meet some of the faces whose names are familiar:



TORREY

You have seen Volta Torrey's by-line on many a piece in Popular Science which has helped make science popular. His father, an enthusiastically electrical engineer, named him after Alessandro Volta (1745-1827), the Italian scientist whose work gave us electric batteries.

Torrey served on the Omaha World-Herald, Chicago Tribune, Cleveland Press, New York Herald Tribune, and PM. In 1939 he leaped from the loud routine of the Associated Press in New York to a Nieman Fellowship at Harvard. Last summer he helped write the report of the U.S. Strategic Bombing Survey—the civilian assessment of air power. In *The Rise and Fall of Germany's Chemical Empire* (p. 66) he tells how science kept the war machine going so long and how it was destroyed at the bottom by bombing.



NEWMAN

Fred Otis Newman has been one of the mainstays of Popular Science for five years. Before that, he put in ten years on the New York Herald Tribune. Son of a Presbyterian minister, he worked his way through Williams,

found himself in Switzerland when Geneva was the bright spot in international relations. He worked with the League of Nations for a couple of years, met an American girl, imported his father to marry them, came back to the U.S. to help get Bennington College started. As a working newspaperman in science, he does a lot of the behind-the-scenes work in making this magazine your magazine.

The name "Alden P. Armagnac" has appeared more frequently in Pop-

ular Science than any other. Although no ancient, he has been a member of the editorial staff for 19 years, joining a year after he left Columbia College and Columbia School of Engineering. His first assignment was to get a photograph of a baboon. Since then, he has cruised on the battleship Iowa and attended atomic sessions with equal aplomb. And he approaches a crackpot invention and the electron microscope with equal sincerity.



SANDERS

Gold Vyrion Sanders is another staff member with the broad newspaper background which helps to keep Popular Science articles practical and informative. He has worked with Reader's Digest and the Committee for Economic Development. As a member of the staff of Popular Science,

Gold Sanders has specialized in simplifying science for people like myself who like the long words spelled out.

Harry Walton is the kind of man who seems always to have a spare washer in his pocket when a faucet is leaking. As Home & Workshop Editor, he is one of the most important people in the place. Walton can spin a yarn of space-ships or carve a model of a drill press with equal ease. He is a prodigious consumer of peanuts and popcorn—which he carries in his brief case, mixed with manuscripts.



GITHENS

My name is not as romantic as Armagnac or as scientific as Volta, but it gets me around—although with some misspelling. It has appeared on the mastheads of Time, Business Week, and the old Life. My grandfather was a good machinist and something of an inventor, but my presence

on this masthead is due more to some twenty years in this people-and-paper business which is publishing. My job as editor is

to act as your agent with all the writers, researchers, photographers, and artists it takes to give you what you want in this magazine about science and the citizen. Next month I would like to introduce other members of the staff and tell you something of how we work.



ARMAGNAC



WALTON

EDITOR.....Perry Githens

MANAGING EDITORS:

Fred O. Newman, Volta Torrey
ART EDITORS: Harry Samuels, Michele de Santis
AVIATION EDITOR.....C. B. Colby
HOME & WORKSHOP EDITOR....Harry Walton
ASSOCIATE EDITORS: Edward F. Allen, Alden P. Armagnac, Devon Francis, James L. Freeman, Wesley S. Griswold, Robert Gorman, Hartley E. Howe, Frank Rowsome, Jr., Gold V. Sanders, Leon Shloss, R. P. Stevenson.

ART ASSOCIATES: Michael Cerniello, Frances Cooper, Samuel Dukler, William Patrick, Stewart Rouse.

PHOTOGRAPHERS: W. W. Morris, Hubert Luckett
EDITORIAL ASSISTANTS: Elsie E. Brandt, Carol Ennis, David McNamara, Lillian Thalenfeld, Ruth Westphal.

PUBLISHER.....Godfrey Hammond





Reports on



"Conscientious study of I.C.S. Courses proves their value beyond doubt."

R. D. CHARLES
Maintenance Superintendent
Africa-Orient Division
Pan American World Airways

RECORDS of Pan American World Airways tell you plenty about the value of I. C. S. Aviation Courses. They show that hundreds of Pan American pilots, co-pilots, flight engineers and maintenance men have taken I. C. S. Courses.

Now flying for just one division of the airline — Latin American — are 336 pilots and co-pilots who are holders of I. C. S. diplomas.

What better endorsement could there be of any institution offering training for Aviation careers?

If you are planning for a place in Aviation, you owe it to yourself to mail the coupon today for full information on the famous I. C. S. Courses. Do it now!

INTERNATIONAL CORRESPONDENCE SCHOOLS



BOX 7646-L, SCRANTON 9, PENNA.

Without cost or obligation, please send me full particulars about the course before which I have marked X:

- Air Conditioning and Plumbing Courses**
- Air Conditioning
- Heating Plumbing
- Refrigeration Steam Fitting
- Chemistry Courses**
- Chemical Engineering
- Chemistry, Analytical
- Chemistry, Industrial
- Chemistry, Mfg. Iron & Steel
- Petroleum Refining Plastics
- Pulp and Paper Making
- Civil Engineering, Architectural and Mining Courses**
- Architectural Drafting
- Architecture
- Bridge and Building Foreman
- Building Estimating
- Civil Engineering Coal Mining
- Contracting and Building
- Highway Engineering
- Lumber Dealer
- Reading Structural Blueprints
- Sanitary Engineering
- Structural Drafting
- Structural Engineering
- Surveying and Mapping

- Electrical Courses**
- Electrical Drafting
- Electrical Engineering
- Power House Electric
- Practical Electrician
- Practical Telephony
- Telegraph Engineering
- Internal Combustion Engines Courses**
- Auto Technician Aviation
- Diesel-Electric
- Diesel Engines Gas Engines
- Mechanical Courses**
- Aeronautical Engineering
- Airplane Drafting
- Flight Engineer
- Foundry Work
- Heat Treatment of Metals
- Industrial Engineering
- Industrial Metallurgy
- Mechanical Drafting
- Mechanical Engineering
- Mold-Loft Work
- Patternmaking
- Reading Shop Blueprints
- Sheet-Metal Drafting
- Sheet-Metal Worker

- Ship Drafting
- Ship Fitting
- Shop Practice
- Steel Mill Workers
- Tool Designing
- Welding, Gas and Electric
- Radio Courses**
- Electronics
- Radio, General
- Radio Operating
- Radio Servicing
- Railroad Courses**
- Air Brake Car Inspector
- Locomotive Engineer
- Locomotive Fireman
- Railroad Section Foreman
- Steam Engineering Courses**
- Boilermaking
- Combustion Engineering
- Engine Running
- Marine Engineering
- Steam Electric
- Steam Engines
- Textile Courses**
- Cotton Manufacturing
- Rayon Weaving

- Textile Designing
- Woolen Manufacturing
- Business and Academic Courses**
- Accounting Advertising
- Arithmetic Bookkeeping
- Business Correspondence
- Business Management
- Certified Public Accounting
- College Preparatory
- Commercial
- Cost Accounting
- Federal Tax
- First Year College
- Foremanship
- French
- Good English
- High School
- Higher Mathematics
- Illustrating
- Motor Traffic
- Postal Service
- Salesmanship
- Secretarial
- Sign Lettering
- Stenography
- Spanish
- Traffic Management

Name..... Age..... Home Address.....

City..... State..... Present Position..... Working Hours A.M. to..... P.M.

Canadian residents send coupon to International Correspondence Schools Canadian, Ltd., Montreal, Canada.
British residents send coupon to I. C. S., 71 Kingsway, London, W. C. 2, England.

DISCOUNT TO DISCHARGED VETERANS—SPECIAL TUITION RATES FOR MEMBERS OF THE ARMED FORCES

MAN-The Mortal God



Unseen Worlds At Your Command!

Possibly there are universes beyond this one to be realized. Perhaps within the nucleus of each atom is the energy of a thousand dynamos—awaiting man's command. But for all of this outward conquest, are you still at the mercy of mysterious *indwelling* forces? No man is a master who has not explored self—to whom the worlds of *inspiration*, *mental creating*, and *intuition* remain dark continents of the mind. Would you like to shatter the illusions of time and space—know what is real and what are the oppressing limitations in life? Would you like to *know* the true purpose of your conscious existence—and experience the Cosmic forces which influences it?

ACCEPT THIS *Free* BOOK

Now is the time to discard obsolete, traditional thought. We are on the horizon of a new era. Learn how nature was intended to obey your commands. Write the Rosicrucians, a world-wide fraternity (not a religion), for their fascinating free book, "The Mastery of Life." It will throw new and searching *light* upon you and your universe.

Address SCRIBE: H. T. W.

THE ROSICRUCIANS (A. M. O. R. C.)
SAN JOSE, CALIFORNIA, U. S. A.



If YOU were Boss would YOU promote “YOU”?

directing the efforts of other men is a valuable asset to any business organization. He never wants for a good job and above average earnings. He gets ahead.

We have helped thousands of men achieve promotion and more money—success sometimes beyond their dreams—a success that was started by a coupon similar to the one below.

Get out of that rut—don't be satisfied with a mediocre job at small pay—be a success in business—this coupon may be your first step.

So send it today—right now—tomorrow never comes for the man who consistently puts things off.

La Salle Extension University *A Correspondence Institution*

Dept. 183-R

417 S. Dearborn, Chicago 5

If you can help me get the ability and knowledge for real promotion, I want to know it. Please send me your free 48 page booklet telling how I can succeed in the field I have checked below. I understand you will send this without obligation to me.

- | | |
|--|--|
| <input type="checkbox"/> Accounting | <input type="checkbox"/> Law: LL.B. Degree |
| <input type="checkbox"/> C. P. A. Coaching | <input type="checkbox"/> Foremanship |
| <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Industrial Management |
| <input type="checkbox"/> Business Management | <input type="checkbox"/> Traffic Management |
| <input type="checkbox"/> Effective Speaking | <input type="checkbox"/> Business English |
| <input type="checkbox"/> Stenotypy | |

Name..... Age.....

Position.....

Address..... Zone, if any.....

City and State



J. E. SMITH, President
National Radio Institute
The man who has directed the Home Study Training of more men for the Radio Industry than any other man in America.

BE YOUR

*I will show you how to start
a Radio Service Business
Full Time or Spare Time without capital*

I Trained These Men



\$35 - \$45 A Week In Own Shop

"Previous to enrolling for your Radio training I made \$12 per week in a hardware store. Now I operate my own repair shop, and often clear \$35 to \$45 a week."—FREDERICK BELL, 76 Golf Ave., St. Johns, Newfoundland.



\$250 A Month In Own Shop

"I am now operating a Radio shop for myself and own all my equipment. Right now I only repair Radios, because there are none to sell, but I average \$250 a month."—J. M. SCRIVENER, JR., Aberdeen, Miss.



Averages Over \$60 A Week

"Not long ago I was working 16 hours a day in a filling station at \$10 a week. Now I have my own Radio business and average over \$60 a week. The N. R. I. course is fine."—ALBERT C. CHRISTENSEN, 1116 Tenth Ave., Sidney, Neb.



\$50 A Week From Own Shop

"Am making over \$50 a week profit from my own shop. Have another N. R. I. graduate working for me. I like to hire N. R. I. men because they know Radio."—NORMAN MILLER, Hebron, Neb.



\$50 A Month In Spare Time

"I have a spare time Radio and Electrical business of my own which has been very profitable, due to the efficient training I received from your Course. Last year I averaged over \$50 a month."—FRED H. GRIFFIE, Rt. 3, Newville, Pa.



Fixing Radios Profitable Hobby

"I am doing Radio work in my spare time and find it a profitable hobby. My extra earnings run about \$10 a week. I certainly am glad I took your N. R. I. Course."—FERDINAND ZIRBEL, Chaseley, N. Dak.

MY COURSE INCLUDES
TELEVISION
ELECTRONICS
FREQUENCY MODULATION

SAMPLE LESSON FREE

SEE
OPPOSITE
PAGE

Let me show you facts about rich opportunities in Radio. See how knowing Radio can give you security, a prosperous future, and let you name *your own hours as your own boss in your own* Radio business. Send the coupon for FREE 64-page book, "Win Rich Rewards in Radio." Read how you practice building, testing, repairing Radios with SIX BIG KITS OF PARTS I send you.

Future For Trained Men Is Bright In Radio, Television, Electronics

The Radio Repair business is booming NOW. In your own spare time or full time Radio business you'll make good money fixing Radios, plus a good profit on Radio parts, and put yourself in line for more profits selling new Radios now that they can be made.

Trained Radio Technicians also find wide-open opportunities in Police, Aviation, Marine Radio, in Broadcasting, Radio Manufacturing, Public Address Systems, etc. And greater opportunities are coming when Television and Electronics are available to the public. Send for free book now!

Many Beginners Soon Make \$5, \$10 A Week EXTRA In Spare Time

The day you enroll I start sending EXTRA MONEY JOB SHEETS to help you make EXTRA money fixing Radios in spare time while learning. You LEARN Radio principles from my easy-to-grasp lessons—PRACTICE what you learn by building real Radio Circuits, with Radio parts I send—USE your knowledge to make EXTRA money in spare time.

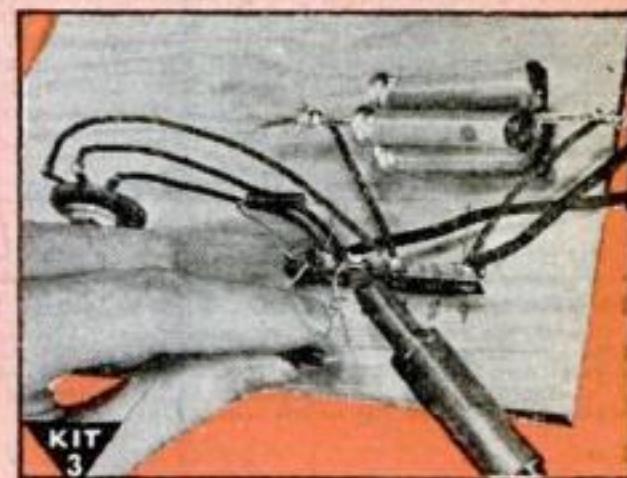
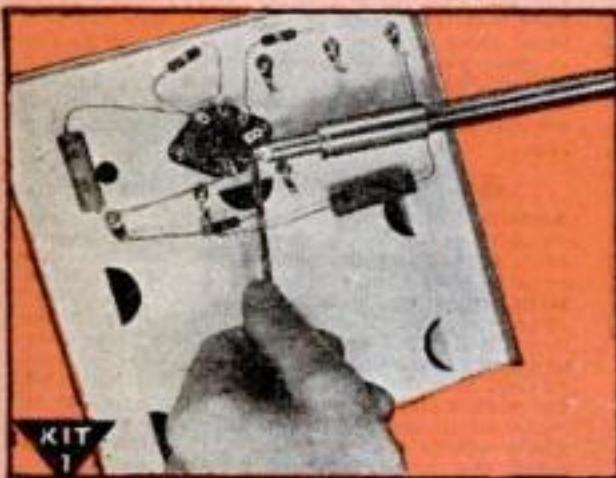
Mail Coupon for Free Copy of Lesson and 64-Page Illustrated Book

I will send you FREE a sample lesson, "Getting Acquainted with Receiver Servicing," to show you how practical it is to train for Radio in spare time. With it I'll send my 64-page, illustrated book, "Win Rich Rewards in Radio." Just mail coupon in an envelope or paste it on a penny postal. J. E. SMITH, President, Dept. 6AP3, National Radio Institute, Pioneer Home Study Radio School, Washington 9, D. C.

A TESTED WAY

OWN BOSS!

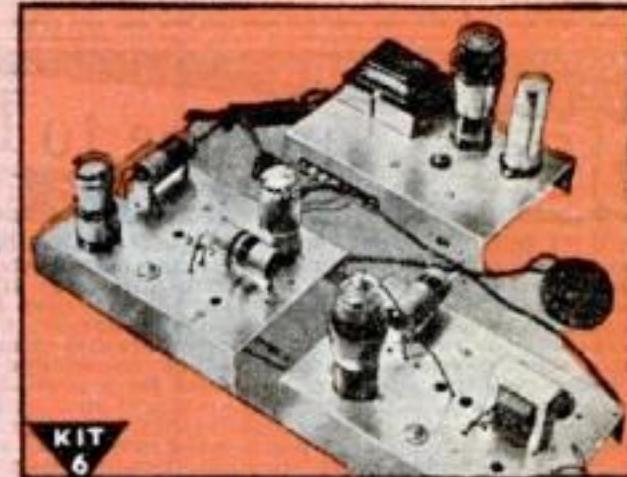
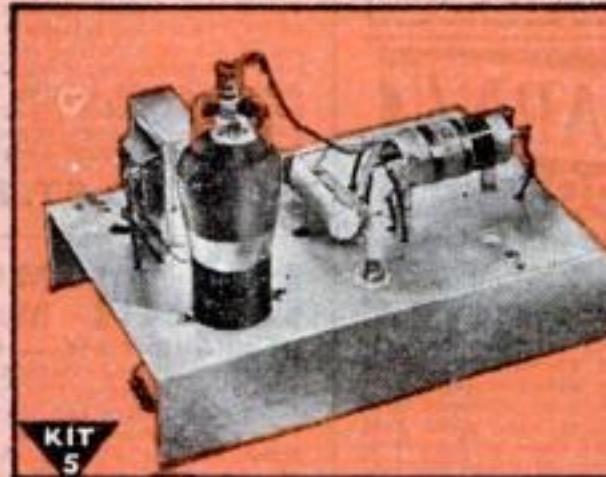
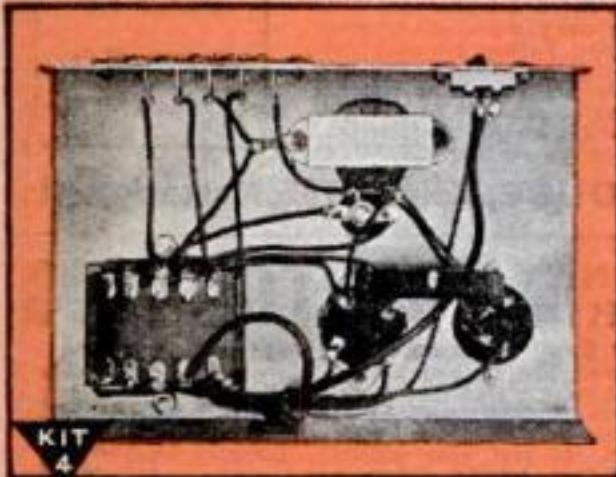
LEARN RADIO BY PRACTICING IN SPARE TIME with 6 Big Kits of Radio Parts I Send You!



I send you Soldering Equipment and Radio Parts; show you how to do Radio soldering; how to mount and connect Radio parts; give you practical experience.

Early in my Course I show you how to build this N.R.I. Tester with parts I send. It soon helps you fix neighborhood Radios and earn EXTRA money in spare time.

You get parts to build Radio Circuits; then test them; see how they work; learn how to design special circuits; how to locate and repair circuit defects.



You get parts to build this Vacuum Tube Power Pack; make changes which give you experience with packs of many kinds; learn to correct power pack troubles.

Building this A. M. Signal Generator gives you more valuable experience. It provides amplitude-modulated signals for many tests and experiments.

You build this Superheterodyne Receiver which brings in local and distant stations—and gives you more experience to help you win success in Radio.

SAMPLE LESSON **FREE**

I will send you a FREE Lesson, "Getting Acquainted with Receiver Servicing," to show you how practical it is to train for Radio at home in spare time. It's a valuable lesson. Study it—keep it—use it—without obligation! Tells how Superheterodyne Circuits work, gives hints on Receiver Servicing, Locating Defects, Repair of Loudspeaker, I.F. Transformer, Gang Tuning, Condenser, etc. Thirty-one illustrations.

**MAIL COUPON FOR FREE LESSON
AND 64-PAGE BOOK**

Good for Both FREE

MR. J. E. SMITH, President, Dept. GAP3,
National Radio Institute, Washington 9, D.C.
Mail me FREE, without obligation,
Sample Lesson and 64-page book, "Win Rich Rewards in Radio." (No salesman
will call. Please write plainly.)

Age.....

Name.....

Address.....

City..... State..... 4FR
(If you have a Post Office zone number please include it)



TO GOOD PAY

The set of
books
that makes
MASTER MACHINISTS
and leads to bigger pay!



This big home-study and reference course gives you the practical facts on machines and methods you need to advance in machine shop work. Take advantage of the other man's experience as found in books, to solve your problems, increase your efficiency, with

**The AMERICAN
MACHINISTS' LIBRARY**

6 volumes—2368 pages—2516 illustrations
(A combined home-study course and reference library)

This library of machine shop practice was written for practical men. It gives you the best methods for every kind of machine shop work. It fully explains lathes, drills, and other machine tools and their operation, automatic screw machines, speeds and feeds, gear design and production, jigs and fixtures, punch and die work, metal surfacing, etc., etc. Plainly written—completely illustrated—the best kind of help to the machine shop man who wants to advance himself.

No money down—special price—easy payments.

EXAMINATION COUPON

McGRAW-HILL BOOK CO., 330 W. 42nd St., N. Y. C. 18

Send me for ten days' examination the American Machinists' Library. If satisfactory I will send you \$1.50 in 10 days and \$3.00 monthly until the price of \$19.50 is paid. If not wanted, I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

Name.....
Home Address.....
City and State.....
Company.....
Position..... PSM. 1-46

No waiting to LEARN

Start at Once to EARN!
This BIG BOOK SHOWS HOW

If it's results you want, you can get action quickly with this practical book. Never before has a more helpful book been printed for those planning a business of their own. Gathered in this large illustrated volume are the formulas, recipes, facts and secrets that have contributed so largely to America's great industrial progress. Capitalize on this information for making most any conceivable product without experience, special equipment or previous knowledge of chemistry. Start at home, expand with profits—build for a profitable independence. The experts who compiled this book are authorities, and present this information in simple, understandable language. They also give you wholesale supply sources for needed materials, short cuts and economy methods for the most profitable results. Hundreds of good paying businesses have been built on a product made from a simple recipe. Opportunities in this field exist everywhere. Choose from any of the 162,000 facts and 10,000 formulas of which the following are only a very few: Adhesives, Alloys, Anti-Freeze Solutions, Cosmetics, Beverages and Liquors, Candy, Gum, Casein, Celluloid, Ceramics, Cheese, Cleaning Preparations, Concrete, Copper, Cotton Dentifrices, Dyes, Embalming Fluids, Enamel Paints, Glazes, Household Formulas, Inks, Insecticides, Iron, Jewelers' Formulas, Lacquers, Laundry Preparations, Leather, Linoleum, Lubricants, Manicure Preparations, Marble (artificial), Metals, Mirrors, Oils, Ointments, Paints, Paper, Perfumes, Photography, Polishes, Powders, Remedies for Man, Beast or Fowl, Rubber Products, Refrigerants, Soaps, Solder and Soldering, Tooth Cements, Transfers, Transparency, Varnishes and Thousands of others for making all sorts of profitable and practical things.

**10,000 FORMULAS, RECIPES
SECRET PROFIT IDEAS**

924 Illustrated
Big Pages



Prepare for "After-War-Business"

Specially recommended for Servicemen and War Workers planning a profitable business of their own.

This comprehensive book is an accepted authority by chemists, schools, industry, etc. and is the largest and most comprehensive book of its kind ever issued. Nothing else like it in existence. A single formula has been worth a thousand times this book's small cost to countless owners. Crammed with money-making ideas. Invaluable for reference. Ideal for Factory, Home, Farm, Office or Workshop. As necessary as the dictionary and more useful for manufacturers, chemists and salesmen who put up products for profit.

ALSO INCLUDED! Complete plans: "D.D.T." insecticide. Also Our New Book of Money Making Facts:—"The More You Know the More You Can Earn—Easier and Quicker."

Immediate Shipment—Safe Delivery Guaranteed. \$2.98 postpaid. Canada or Foreign, \$3.25 U.S. Funds. (C.O.D. shipments U.S.A. only.)

ADAMS BROWN COMPANY Books of Applied Science
Dept. 401, Chestnut Hill 67, Massachusetts, U. S. A.

This Complete Book Only
\$2 98
POST PAID

Worth More

How to Make Money by Mail

Down-to-earth facts, directions (illustrated) for running business profitably, using expertly for your good fortune the employees, trains, planes which Gov't places at your disposal **CHEAP**. Get orders by mail, ship by express or freight or mail, get out of the kindergarten . . . 3d printing of this book now selling. It's YOUR winner. Make this year and the following years worth more.

THE EASY WAY to start new or expand your present occupation. Do it NOW. Extraordinary plain, simple skill, know-how. No theory. Fact story of rich experience of author E. Rice day-by-day. How many times have we heard: "I wish I had some money, this patent would earn me a fortune," or "why can't my crop pay better?" or "I wish I knew how to sell this gadget myself," or "why should my boss alone do this when I know too how the money is made?" Listen, you do not need money to start this Rice way. His method automatically pays all bills same day rendered, no bank loans, pay as you go, no borrowing from relatives or friends, no salesmen. Also no worry, quickly a home of your own all paid for. Rice paid off \$5000 in mortgages a year after using this idea.

44 Years of PROOF

Sounds fishy? Sure, but this has been done steadily for 44 years, depression or no depression, by the author: that is why he wrote this book to pass the good word along. Make it go with anything you have which is salable. Rice made his plan work when living in one room in a city lodging house. Turn your city or country home, your work, your hobby, into money. How to get orders at cost of only \$4 for each \$100 taken in. The popular error to avoid in trying for sales. Business won free while others have to pay for it. How to conceive the money-getting advertisement.

Profitable changes from ordinary ideas and methods. Not usual cut-dried pattern, 60 adventures, a dictated book in everyday talk, no dictionary writing. Take a chance on this book being worth a fortune to you and yours and send \$2.50. Book mailed same day order is received. Or ask two friends to chip in 83 cents each with your 84c to get this book. Hundreds of buyers whose letters we show you declare emphatically its superlative goodness. Follow its easy pattern for success. Cloth-bound, 512 pp., 8½ by 5½. Best seller, 3d edition now selling. Cut out the \$2.50 HOW BOX here, pin or stick it to sheet of paper bearing your name and address, mail in envelope with money order or check for \$2.50 to

HOWARD ST. HOUSE, Melrose 76E, Massachusetts

LEARN MONEY-MAKING CARTOONING

IN SPARE TIME — by Easy Picture Chart Method Same Simplified Method that has helped train creators of "Terry & Pirates," "Freckles," "Out Our Way," "Winnie Winkle," "Reg'lar Fellers," "Strange As It Seems," "The Neighbors," and many others. Learn while learning. Send 10c for Picture Chart (to test your ability). Samples of successful students, and full details. (State age.) Landon School of Cartooning, Dept. 4621, Philadelphia 1, Pa.



**\$5, \$10, \$15
FOR ONE DRAWING**
Be an ARTIST!

—Train at Home in Your Spare Time

The fascinating field of Art offers commercial opportunities to men and women. COMMERCIAL ART, CARTOONING, DESIGNING all in one complete course. TWO ART OUTFITS furnished. Learn to draw step-by-step. Trained Artists are capable of earning \$30, \$50, \$75 a week. Write today for full information in FREE BOOK. "Art for Pleasure and Profit." Mail coupon now.

FREE BOOK gives details

Washington School of Art, Studio 131C
1115-15th St., N. W., Washington 5, D. C.

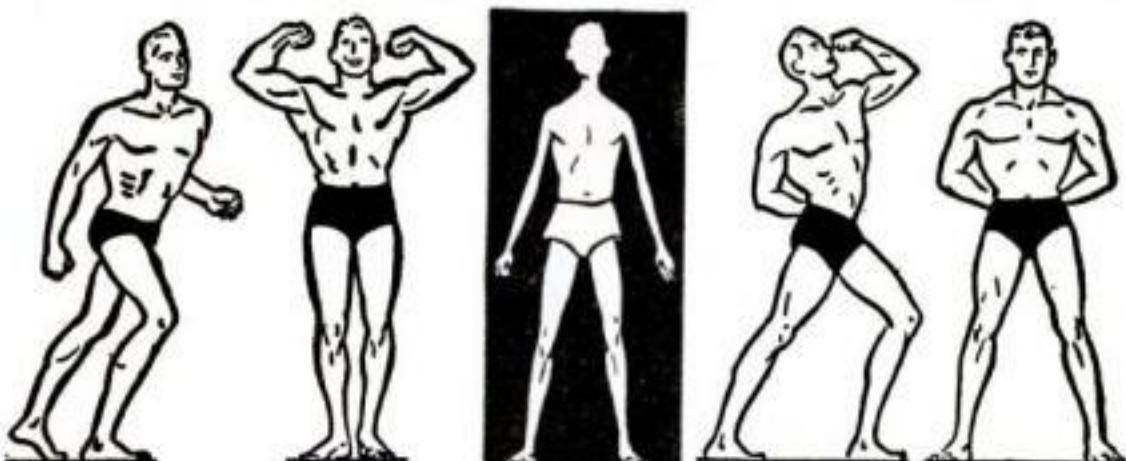


Name..... Age.....

Address.....

City..... Zone () State.....

Are You Satisfied with your body?



Let Me PROVE I Can
Make You a NEW MAN in
Only 15 Minutes a Day!

HOW do YOU look stripped—in locker-room or gym? Skinny, scrawny, sparrow-chested, self-conscious, HALF ALIVE?

How do you feel when people notice your *physique*? Can you stand their gaze? If you're not satisfied with your present physical development, let me prove I can make you a New Man—in only 15 minutes a day, right in the privacy of your own home! I'll give you biceps like iron and a fine, deep chest. I'll broaden your shoulders, add ridges of solid muscle to your stomach, fill out your arms and legs. If you are fat and flabby, I'll streamline you into a picture of radiant manhood.

What "Dynamic Tension" Can Do

How? "Dynamic Tension!" That's the secret that changed me from a flat-chested 97-lb. weakling into the red-blooded HE-MAN that I am today. That's how I'm turning thousands of fellows like yourself into New Men—with husky, handsome body and tireless endurance. I can do the same for you. Let me PROVE it!

"Dynamic Tension" is a PRACTICAL and NATURAL method. You use no tiring apparatus, no muscle-straining gadgets. My method is actually FUN! In only 15 minutes a day, you will actually see your muscles increase into powerful bulges of brawn and strength. You'll enjoy new stamina, a glad-to-be-alive feeling. Before you know it, you'll have a rugged, handsome body, a rough-and-ready ambition surging out of you that the world can't lick! I'll show you how it really feels to LIVE!

SEND FOR FREE BOOK

All I ask is that you mail the coupon NOW for my illustrated FREE book, "Everlasting Health and Strength." It shows actual photos of pupils I've changed from weaklings into remarkable specimens of manhood. If you want a body that men respect and women admire, then get this coupon into the mails as fast as you can. Address me personally: CHARLES ATLAS, Dept. 1A, 115 E. 23rd St., New York 10, N. Y.



Charles Atlas

An untouched photo of Charles Atlas, twice winner and holder of the title, "The World's Most Perfectly Developed Man."

**CHARLES ATLAS, Dept. 1A,
115 East 23rd Street, New York 10, N. Y.**

I want the proof that your system of "Dynamic Tension" will help make a New Man of me—give me a healthy, husky body and big muscle development. Send me your free book, "Everlasting Health and Strength."

Name..... (Please print or write plainly)

Address.....

City..... (if any)..... State.....

Check here if under 16 for Booklet A

INVENT

NOW IS THE TIME TO PATENT AND SELL YOUR INVENTION

Now, more than ever before, is the right time to patent and sell your invention. Why? Because manufacturers everywhere, in striving to keep ahead of competition, are looking for new inventions and buying up the patent rights thereon so that they will have better and more attractive items to make and sell. Hence, the wise thing for you to do is also to act at once. Protect your invention—and yourself—by applying for a patent now.

FREE "PATENT GUIDE" EXPLAINS WHAT TO DO

Our Free 48 page "Patent Guide for the Inventor", containing complete information about patent procedure and selling inventions, answers many important questions concerning Patents that inventors constantly ask. It tells what facts, details, drawings, sketches, etc., are necessary to apply for a Patent; how to protect your invention through dated and witnessed disclosure; how to do this at once to safeguard your rights; how Patent Office Records can be checked to determine whether the invention is probably patentable before filing fees need be paid; discusses costs involved and a practical way these can be paid as the application progresses. It tells how some inventors secured financial backing; how many simple inventions have proved large commercial successes; how Patents covering improvements also can be profitably utilized and marketed; and countless other facts that every inventor will want to know. And in addition, our "Patent Guide" contains illustrations of over 150 basic mechanical movements.

WHY YOU NEED EXPERT ASSISTANCE

The Patent Laws were enacted for your benefit—to give you protection for the features of your invention which are Patentable. But these features must be legally and concisely set forth in the form of "claims". This phase of the procedure is so complex that the U.S. Patent Office advises the Inventor to engage a competent Registered Patent Attorney. We maintain a large staff—carefully trained registered patent attorneys—expert draftsmen—experienced searchers—to serve you. We have been serving inventors for more than twenty years. Write for a free copy of our "Patent Guide for the Inventor" today. Clarence A. O'Brien & Harvey B. Jacobson, Registered Patent Attorneys, 62-A Adams Building 4, Washington, D. C.

**CLARENCE A. O'BRIEN
& HARVEY B. JACOBSON**
REGISTERED PATENT ATTORNEYS

Free Book for **INVENTORS**

FREE "RECORD OF INVENTION"

With our free "Patent Guide for the Inventor" you will receive also free a "Record of Invention" form. This "Record of Invention" enables you to conveniently make a proper, dated disclosure of your invention before you file your patent application, which will prove of great value to you, should the occasion for evidence arise.

TAKE FIRST STEP NOW

Remember, in Patent matters action is important. Delay can be costly. Therefore, take your first step now—toward protecting your invention. Send for your free copy of our "Patent Guide for the Inventor" containing complete information about patent procedure and selling inventions. At the same time, receive a free "Record of Invention" form with complete instructions for making a disclosure of your invention and establishing its date. This step costs you nothing—yet may be vital to your success. Mail the coupon in an envelope, or paste it on a penny postcard—now.

*Worthy of
Your Trust*

**48
PAGES
Over 150
Mechanical
Movements**



CLARENCE A. O'BRIEN & HARVEY B. JACOBSON

CLARENCE A. O'BRIEN & HARVEY B. JACOBSON
Registered Patent Attorneys before the United States Patent Office
62-A Adams Building, Washington 4, D. C.

Please send me your 48-Page "Patent Guide for the Inventor" and your specially prepared "Record of Invention" form FREE. This request does not obligate me.

Name.....

Address

City..... State.....

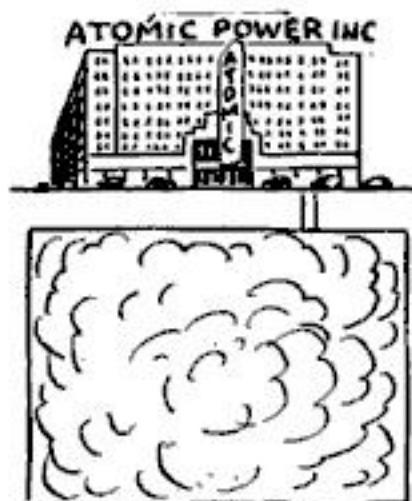
— — — — — (Please write or print plainly.) — — — — —

Readers Say:

Some Advanced Thoughts on Atomic Energy

As I understand it, the energy in the atomic bomb is similar to the energy contained in most other dry explosives such as black powder, dynamite, TNT, etc. . . . We use compression chambers for gas, acetylene, and air. We dam water, and create huge reservoirs of potential power. Would it not

be possible to detonate dry explosives in compression chambers and release the energy thus created through a system of valves to operate turbines or compressed-air devices? Or, if the gas produced by these explosives is inflammable, couldn't it be used in the same way as acetylene or city



gas? As an illuminant, for instance.

These compression chambers could be built underground; perhaps the size of a city block and the depth of a 20-story building. A system similar to that used in the breech of a gun could be adapted to introduce the detonation charge to prevent backfiring from the compression chamber.

In countries where common sources of energy, such as water, coal, and oil, are scarce or not available except by importation, this use of dry explosives might be possible and practical. The power in dynamite, TNT, or an atomic bomb is power in highly concentrated and proportionately light form, and the shipment of these explosives over long distances does not offer serious difficulties. Therefore, when suitable compression chambers are developed here and made available in countries where power is scarce, we shall be able to export atomic power much more economically than we can send bulky shiploads of coal and gasoline abroad.—S. C. R., Portland, Ore.

He Suggests a Name for Atomic Power

MY GENERAL-SCIENCE teacher tells me that no name has yet been decided upon for the unit of atomic power. My suggestion is that it be called Atomic Thermal Unit, or, abbreviated, A.T.U. I believe that the calorie and the British thermal unit are too small to measure the thermal energy released by the disintegration of the atom.—D. A. S., Dayton, Ohio.

The Broom-Straw Test for Watermelons

IN YOUR November issue there is a letter from F. J. asking why a broom straw, placed horizontally across a watermelon, will turn to an angle of 45 degrees if the melon is ripe and remain still if the melon is green. There is an electrical charge or force in all growing things that produces the movement of the straw, but this charge grows less as death approaches, ceasing entirely at death. Ripe-ness in fruit is, of course, the state of death, even though decay has not set in.—Dr. J. H. D., Houston, Texas.

THE broom straw on the watermelon reminds me of the way Chinese test ivory in the market at Hong Kong. They take a broom straw or a small sliver of wood, place a drop of water on the ivory, and rest the straw in it. If it is real ivory, the straw swings in the direction of the grain. It never fails.—P. G. P., Van Nuys, Calif.

Schoolmaster Hands Us a Pretty Nosegay



WHAT a magazine! As far as I can gather, your Readers Say department is 99 percent a collection of letters describing the amount of work their writers do NOT do when they receive your magazine. Men lose a complete night's sleep, housewives drop everything (Mrs. M. W. S., P. S. M., Nov. '45, p. 20), and at the time I am writing this letter, I should be preparing for classes tomorrow in English, Latin, and French. It's not at all helpful, but keep it up.—W. H. E., St. Paul's School, Concord, N. H.

This FREE BOOK Helps Inventors To Protect Their Inventions

MODERN BUSINESS WANTS INVENTIONS

Practical and novel inventions are in big demand today. The opportunity for quick money is enticing. Sales sources are many if your invention has merit. But, be sure—before you place your device in strange hands—that it is fully protected. A United States Patent gives you this protection. *The first step toward inventive success always is—and always has been—the application for a U. S. Patent. There is no other way to protect your invention in accordance with the laws of this country.*

MAKE THIS RECORD NOW If you have an invention, and wish to secure it for the future, act at once. Have it dated now and recorded in our office. We will send you this FREE Invention Record Form for the purpose. Fill out the Invention Record Form fully describing the nature of your invention. Make a sketch of its main features. Mail it to us and we will record the date it was received in our office. The earlier the date the better your chance of combating rival inventors who may lay claim to your idea later. *Don't delay a single minute in taking this important step. Your whole future may depend upon it. Mail the coupon for our FREE Invention Record Blank and New FREE Book Today!*

HOW WE SERVE YOU AS REGISTERED PATENT ATTORNEYS The U. S. Patent Office strongly recommends—unless the inventor is familiar with such matters—that he employ the services of a Registered Patent Attorney in the preparation of his Patent Application. We are Registered Patent Attorneys fully qualified to represent you at the Patent Office. We have had long experience in studying hundreds of types of inventions. This gives us the ability to judge your invention and to describe it accurately and convincingly in technical language. It gives us the perception to center arguments upon those details of your invention which, in our judgment, will be looked upon most favorably by the Patent Office Examiner.

Mail the coupon today for our new FREE Book, "How to Protect, Finance and Sell Your Invention," and our FREE Invention Record Form—maybe this step will pave the way to future security for you and your family. Act Today!

We paint no glowing road to fortune—but if you have an invention . . . if it serves a definite new need . . . if the public accepts it—we can tell you it may provide the security and benefits you are seeking.

McMORROW & BERMAN
Patent Attorneys
142-H Atlantic Building
Washington 4, D. C.

JANUARY, 1946



H. E. McMORROW & HYMAN
REGISTERED ATTORNEYS—PATENT ATTORNEYS



FREE
Invention Record

Know How Successful Inventors Protect and Sell Their Inventions

Our new FREE Book is the latest volume on Inventions and Patents off the press. It's a book every inventor should have. Mail the coupon today for our book "How to Protect, Finance and Sell Your Invention" and learn these important facts.

- How to know if there is a prior U. S. patent on your invention.
- How to save steps in getting patent action.
- How we prepare your application for presentation to the Patent Office.
- How you may patent an improvement on something in use now.
- How to obtain funds to patent and promote your invention.
- How to find a buyer or backer for your invention.
- How to protect yourself in making royalty agreements.

These and many other inventive facts you'll learn by reading our new FREE Book, "How to Protect, Finance and Sell Your Invention."

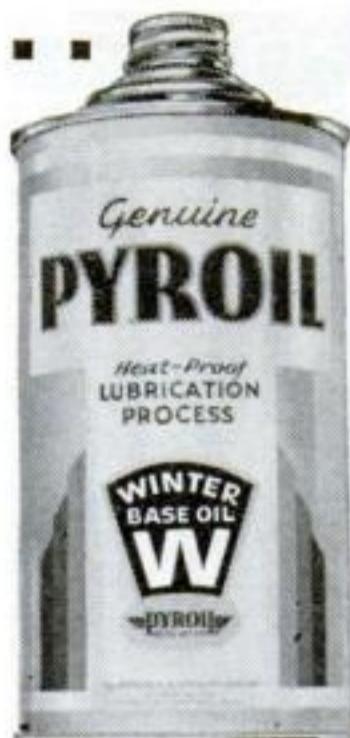
Mail coupon now!



PATENT ATTORNEYS
142-H Atlantic Building, Washington 4, D. C.
Send me your new FREE book, "How to Protect, Finance and Sell Your Invention," and "Invention Record" form at once.
I understand that this request does not obligate me.

NAME _____
ADDRESS _____
CITY _____
STATE _____
(Write or print name clearly)

for easy STARTING start using . . .



—The time to condition your car for easy cold weather starting is while you are running it. If you have Pyroil B or W in your lubricating system, a constant self lubricating surface is maintained on bearing surfaces. (Pyroil W is the Winter Grade of Pyroil B.) This surface is maintained even after you stop . . . it does not run off. When you start again . . . it is a lubricated start. No wearing metal to metal contact. No heavy battery drain. Protect your car with Pyroil B or W . . . simply ask your gas station service man.

**Manufactured and Guaranteed by Pyroil Company,
W. V. Kidder, Founder, 108 Main Street, LaCrosse,
Wis.**

**PYROIL COMPANY
108 Main Street, La Crosse, Wisconsin**

I want my car to last and run properly. Please tell me more about Pyroil and how it can accomplish this for me.

Name.....

Address.....

City or Town..... State.....



*Jerry, the talking dog is
entertaining hospitalized
veterans, by courtesy of the
PYROIL Company.*

Readers Say:

How to Remove Printing from Empty Flour Bags

You wash the flour or feed bags in warm water to remove the remaining flour. Then wring them out so they will not drip. Rub thoroughly with a good laundry soap and sprinkle generously with a household baking soda, rubbing it well into the material. Roll the bags up tightly and let them soak for two or three days. This will loosen the printing.

Then you unroll the bags and give them a good boiling in a washboiler or other large utensil (not aluminum), using enough soap to make a good suds and adding two or three tablespoonfuls of soda to a half boiler of water. Punch and stir with a stick several times during the boiling. If all the printing does not come out, wring the bags, rub the remaining letters well with soap, and boil a second time in a fresh solution, adding baking soda as before. When the bags are free of printing, rinse them thoroughly and hang them out to dry.—Mrs. F. W. B., Corvallis, Ore.

Making a Hammer More Attractive Becomes an Easy Matter

ANSWERING the query by E. M. C., it is easy to remagnetize a hammer by simply winding a coil around the head and applying pure DC (not AC) to the coil. If the voltage is high, you put a resistor in series with the coil. A lamp bulb is an excellent resistor for this purpose. You can check the polarity of the magnetic field by means of a compass. No time is set for the process, but 15 minutes is about right for a hammer.—K. B. G., S/1c RT, USNR, Washington, D. C.



Reader Shares Secret of First Aid to Rusty Cars

I HAVE found that the use of valve-grinding compound on rusty bumpers and other badly corroded parts of an auto will clean them to a shining luster.—S 1/c C. W. M., Rochelle, Ill.

AUDELS REFRIGERATION & AIR CONDITIONING GUIDE....\$4

New from Cover to Cover—1280 Pages, Fully Illus. Covering basic principles, servicing, operation & repair of household, commercial & industrial refrigeration & air conditioning. A gold mine of essential important facts for engineers, servicemen, users.

AUDELS CARPENTERS & BUILDERS GUIDES—4 Vols.\$6

A practical illustrated trade assistant on modern construction for carpenters, joiners, builders, mechanics and all woodworkers. 4 vols., 1600 pages, 3700 illustrations, flexible covers. Pocket size. Each volume sold separately \$1.50 a vol.

AUDELS AUTOMOBILE GUIDE....\$4

A practical quick ready reference book for auto mechanics, service men, operators & owners. Explains theory, construction & servicing of modern motor cars, trucks, buses & auto type Diesel engines. 1540 pages, fully illustrated. 55 chapters. Indexed. A standard book for mechanics. New fluid drive covered.

AUDELS DIESEL ENGINE MANUAL....\$2

A practical, concise treatise with questions and answers on the theory, operation and maintenance of modern diesel engines including General Motors 2 cycle Diesel. 384 pages, fully illus., flexible binding, pocket size. All details plainly brought out, this book is of extreme value to engineers, operators & students.

AUDELS WIRING DIAGRAMS....\$1

210 Pages. Illustrated. Gives practical facts on wiring of electrical apparatus. It shows clearly how to wire apparatus for practically all fields of electricity. Each diagram is complete & self-explanatory. Highly Endorsed Pocket Companion.

AUDELS PLUMBERS & STEAMFITTERS GUIDES—4 Vols.\$6

A Practical Trade Assistant & Ready Reference. Explains in plain language & by clear illustrations, diagrams, charts, graphs, pictures principles of modern plumbing practice including Marine Pipe Fitting and Air Conditioning. 4 Vols.—1670 Pages—3612 Diagrams. Pocket size. Each Vol. Sold Separately \$1.50 a Vol.

AUDELS SHEETMETAL WORKERS HANDY BOOK....\$1

Practical inside information. Fundamentals of Sheet Metal Work. 388 pages. Illustrated. 11 sections. Clearly written. Essential & important facts, figures, pointers in everyday language. Ref. Index.

AUDELS SHEETMETAL PATTERN LAYOUTS....\$4

Developed by Experts for Sheet Metal Workers. Layout Men & Mechanics. A Practical Encyclopedia in 10 Sections, size 7 x 10 x 2—1125 Pages—350 Layouts—1600 Illustrations. 1001 Key Facts. Fully indexed for ready reference in answering your layout problems. Covers all phases of sheet metal work including Pattern Cutting, Pattern Development & Shop Procedure.

AUDELS ANSWERS ON BLUE PRINT READING....\$2

For Mechanics & Builders. Covers all types of blue print reading including ship & airplane. 376 pages, fully illustrated.

AUDELS NEW MACHINIST & TOOLMAKERS HANDY BOOK....\$4

Covers modern machine shop practice in all its branches. 5 practical books in 1. New from cover to cover. Tells how to set up & operate lathes, screw and milling machines, shapers, drill presses and all other machine tools. 1600 pages, fully illustrated, 5 x 6 1/2 x 2. Indexed. 5 sections. 1—Modern Machine Shop Practice. 2—Blue Print Reading & How to Draw. 3—Calculations & Mathematics for Machinists. 4—Shop Physics. 5—How to Use the Slide Rule. 60 chapters. Easy to read and understand. A shop companion that answers your questions.

AUDELS MATHEMATICS & CALCULATIONS FOR MECHANICS \$2

Mathematics for home study or reference. 700 pages, 550 illus. Practical mathematics from beginning. How to figure correctly. Easy, correct methods covering a complete review. Ill. & Indexed.

AUDELS HANDY BOOK OF PRACTICAL ELECTRICITY....\$4

For maintenance engineers, electricians & all electrical workers. 1440 Pages, 2600 Illus. Covers important electrical information in handy form—including Marine Wiring, Radio Principles, Welding. Indexed. A key to a practical understanding of electricity.

AUDELS RADIOMANS GUIDE....\$4

A key to the practical understanding of radio including Frequency Modulation, Television, etc., Aircraft & Marine Radio. For radio engineers, servicemen, amateurs. 772 pages. 400 Illustrations & Diagrams. Photos. Review Questions & Answers, Reference Index. Authentic, clear, concise.

AUDELS ELECTRONIC DEVICES....\$2

Tells What You Want to Know About Electric Eye. Easily Understood. Covers photo-electric cells & their applications. Amplifiers, illumination, frequencies, voltage, photocell, tubes, Ohm's Law, wiring diagrams, etc.

AUDELS WELDERS GUIDE....\$1

A concise, practical text on operation & maintenance of all welding machines for all mechanics. Over 400 pages, illustrated. Covers all methods of electric and acetylene welding including airplane work.



AN AUDEL GUIDE IS A GOOD FRIEND!

Use the brains and experience of others in these Guides of the Trades. Save time and money with right methods, short cuts, labor saving ideas. CHECK NOW! You can look over any Audel Guide in your home. Start the Easy Payments if satisfied.

-----CUT HERE-----

MAIL ORDER

THEO. AUDEL & CO., 49 W. 23 St., New York 10, N.Y.

Please mail me for 7 days' free examination the books marked (X) below. I agree to mail \$1 in 7 days on each book or set ordered, and to further mail \$1 a month on each book or set ordered until I have paid purchase price.

If I am not satisfied with Guides I will return them.

<input type="checkbox"/> Audels REFRIGERATION & Air Conditioning Guide	\$4.
<input type="checkbox"/> Audels POWER PLANT ENGINEERS GUIDE	4.
<input type="checkbox"/> Audels PUMPS, HYDRAULICS & AIR COMPRESSORS	4.
<input type="checkbox"/> Audels WELDERS GUIDE	1.
<input type="checkbox"/> Audels BLUE PRINT READING	2.
<input type="checkbox"/> Audels SHEET METAL WORKERS Handy Book	1.
<input type="checkbox"/> Audels SHEET METAL PATTERN LAYOUTS	4.
<input type="checkbox"/> Audels AIRCRAFT WORKER	1.
<input type="checkbox"/> Audels MATHEMATICS and CALCULATIONS	2.
<input type="checkbox"/> Audels MACHINISTS & TOOLMAKERS Handy Book	4.
<input type="checkbox"/> Audels MECHANICAL Dictionary	4.
<input type="checkbox"/> Audels AUTOMOBILE GUIDE	4.
<input type="checkbox"/> Audels DIESEL ENGINE MANUAL	2.
<input type="checkbox"/> Audels MARINE ENGINEERS Handy Book	4.
<input type="checkbox"/> Audels SHIPFITTERS Handy Book	1.
<input type="checkbox"/> Gueths MECHANICAL DRAWING COURSE	1.
<input type="checkbox"/> Rogers DRAWING and DESIGN	2.
<input type="checkbox"/> Audels MILLWRIGHTS and Mechanics Guide	4.
<input type="checkbox"/> Audels CARPENTERS and Builders Guides (4 vols.)	6.
<input type="checkbox"/> Audels PLUMBERS and Steamfitters Guides (4 vols.)	6.
<input type="checkbox"/> Audels MASONS and Builders Guides (4 vols.)	6.
<input type="checkbox"/> Master PAINTER and DECORATOR	2.
<input type="checkbox"/> Audels GARDENERS & GROWERS GUIDES (4 vols.)	6.
<input type="checkbox"/> Audels ENGINEERS and Mechanics Guides Nos. 1, 2, 3, 4, 5, 6, 7 and 8 complete	12.
<input type="checkbox"/> Audels Answers on Practical ENGINEERING	1.
<input type="checkbox"/> Hawkins Aids to ENGINEERS EXAMINATION	2.
<input type="checkbox"/> Audels ELECTRICIANS EXAMINATIONS	1.
<input type="checkbox"/> Audels WIRING DIAGRAMS	1.
<input type="checkbox"/> Audels Handy Book of PRACTICAL ELECTRICITY	4.
<input type="checkbox"/> Audels ELECTRICAL POWER CALCULATIONS	2.
<input type="checkbox"/> Hawkins ELECTRICAL Guides at \$1. each	10.
<input type="checkbox"/> Audels ELECTRONIC DEVICES	2.
<input type="checkbox"/> Audels ELECTRIC Dictionary	2.
<input type="checkbox"/> Audels RADIOMANS GUIDE	4.
<input type="checkbox"/> Audels NEW ELECTRIC LIBRARY at \$1.50 a Volume Vols. I, II, III, IV, V, VI, VII, VIII, IX, X, XI, XII.	

Name.....

Address.....

Occupation.....

Employed by.....

P.S.M.

AUDEL, Publishers, 49 W. 23 St., N.Y. 10



Get Your Copy of This NEW EDITION of Piper's Famous "How to Fly" Booklet!

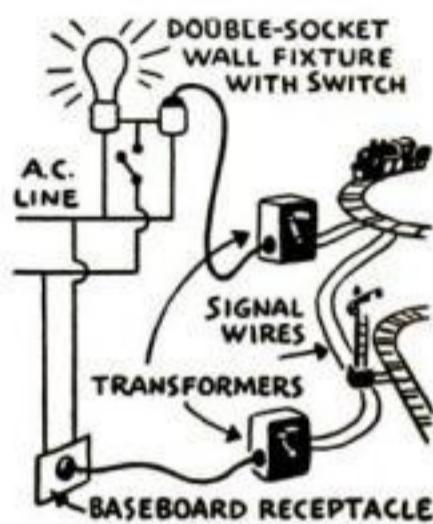
More colorful, interesting and instructive than ever! "How to Fly a Piper Cub" takes you on a typical flight lesson with over 50 photographs and descriptions. Written by a certificated flight instructor. Includes many other features and full-color pictures of Piper Cub planes. For booklet send 10c in stamps or coin for postage-handling. Piper Aircraft Corporation, Dept. PS16, Lock Haven, Pennsylvania.



Readers Say:

The Strange Behavior of a Toy-Train Hookup

WE HAVE two electric-train outfits and a transformer for each. One was plugged into a baseboard outlet, the other into a double-socket wall fixture that had a bulb in the second socket. When the fixture switch was off but the first transformer was on, a queer thing happened. The 110-volt bulb in the fixture lit up almost as brightly as though it were turned on. The only connection between the two track systems was a signal hookup. How come?—R. E., White Plains, N. Y.



Your first transformer stepped down the 110-volt AC to, say, 15 volts. The signal hookup permitted this to reach the second track system and so to flow into the secondary of the second transformer. This transformer then worked in reverse, stepping up the 15-volt current to approximately 100 volts in the primary, which was applied to the fixture socket. As twin sockets are wired in parallel, this voltage was applied to the bulb and lit it.—Ed.

Another Jade Prospector Strikes Pay Dirt

AFTER reading P.S.M. for five years, I came across the article on jade, so with my wife and dad I went to Wyoming and found a lot of it in all shades of green. We also found some Rocky Mountain diamonds, also known as smoky topaz. I am now in Denver, where I am going to build my own cutting and polishing tools from directions in old P.S. Ms. I am also going back to Wyoming next summer. I am an Indian, and I love that land.—A. H., Denver, Colo.

Who Has a Recipe for Leaf Preservation?

I WONDER if any of your readers could supply information on the curing and painting of leaves, wheat, oats, flowers, weeds, etc. for wintertime bouquets.—Mrs. J. B. H., Pensacola, Fla.

I'LL SHOW YOU HOW TO SUCCEED IN RADIO

Here's the right
training for
Big Post-War
Pay!



F. L. Sprayberry, one
of the country's fore-
most Radio Teachers.

RADIO CLINIC

ALL WORK GUARANTEED



A RADIO SERVICE
BUSINESS OF YOUR OWN



A GOOD JOB IN RADIO &
TELEVISION BROADCASTING



RADIO-ELECTRONIC
SERVICE ENGINEER

BE A RADIO-ELECTRONICIAN



I SUPPLY A
FULL RADIO SET
for practical easy
LEARNING



NOW! YOU CAN PREPARE AT HOME IN SPARE TIME
FOR AMAZING OPPORTUNITIES AHEAD IN

RADIO • ELECTRONICS • TELEVISION

The offer I make you here is the opportunity of a lifetime. It's your big chance to get ready for a wonderful future in the swiftly expanding field of Radio-Electronics INCLUDING Radio, Television, Frequency Modulation and Industrial Electronics. Be wise! NOW'S the time to start. Opportunities ahead are tremendous! No previous experience is necessary. The Sprayberry Course starts right at the beginning of Radio. You can't get lost. It gets the various subjects across in such a clear, simple way that you understand and remember. And, you can

master my entire course in your spare time. It will not interfere in any way with your present duties. Along with your Training, you will receive my famous **BUSINESS BUILDERS** which will show you how to make some nice profits while learning.

Prepares You for a Business of Your Own or Good Radio Job

My training will give you the broad, fundamental principles so necessary as a background, no matter which branch of Radio you wish to specialize in. I make it easy for you to learn Radio Set Repair and Installation Work. I teach you how to install and repair Electronic Equipment. In fact, you'll be a fully qualified **RADIO-ELECTRONICIAN**, equipped with the skill and knowledge to perform efficiently and to make a wonderful success of yourself.

JUST OUT! FREE!

"How to Read Radio Diagrams and Symbols"

a valuable new book explaining in simple English how to read and understand any Radio Set Diagram or circuit. Includes translations of all Radio symbols. Send for this FREE book now, and along with it I will send you another big FREE book describing my Radio-Electronic training.



GET FREE BOOKS

SPRAYBERRY ACADEMY OF RADIO

F. L. Sprayberry, President
Room 5516, Pueblo, Colorado

Please rush my FREE copies of "How to MAKE MONEY in RADIO, ELECTRONICS and TELEVISION," and "How to READ RADIO DIAGRAMS and SYMBOLS."

Name..... Age.....

Address.....

City..... State.....

(Mail in plain envelope or paste on penny postcard)

SPRAYBERRY TRAINING GIVES YOU BOTH TECHNICAL KNOWLEDGE—SKILLED HANDS

There's only one right way to learn Radio Electronics. You must get it through simplified lesson study combined with actual "shop" practice under the personal guidance of a qualified Radio Teacher. It's exactly this way that Sprayberry trains you . . . supplying real Radio parts for learn-by-doing experience right at home. Thus, you learn faster, your understanding is clear-cut, you acquire the practical "know how" essential to a good-paying Radio job or a Radio business of your own.

I'll Show You a New, Fast Way to Test Radio Sets Without Mfg. Equipment.

The very same Radio Parts I supply with your Course for gaining pre-experience in Radio Repair work may be adapted through an exclusive Sprayberry wiring procedure to serve for complete, fast, accurate Radio Receiver trouble-shooting. Thus, under Sprayberry methods, you do not have one

cent of outlay for manufactured Test Equipment which is not only expensive but scarce.

DON'T PUT IT OFF!

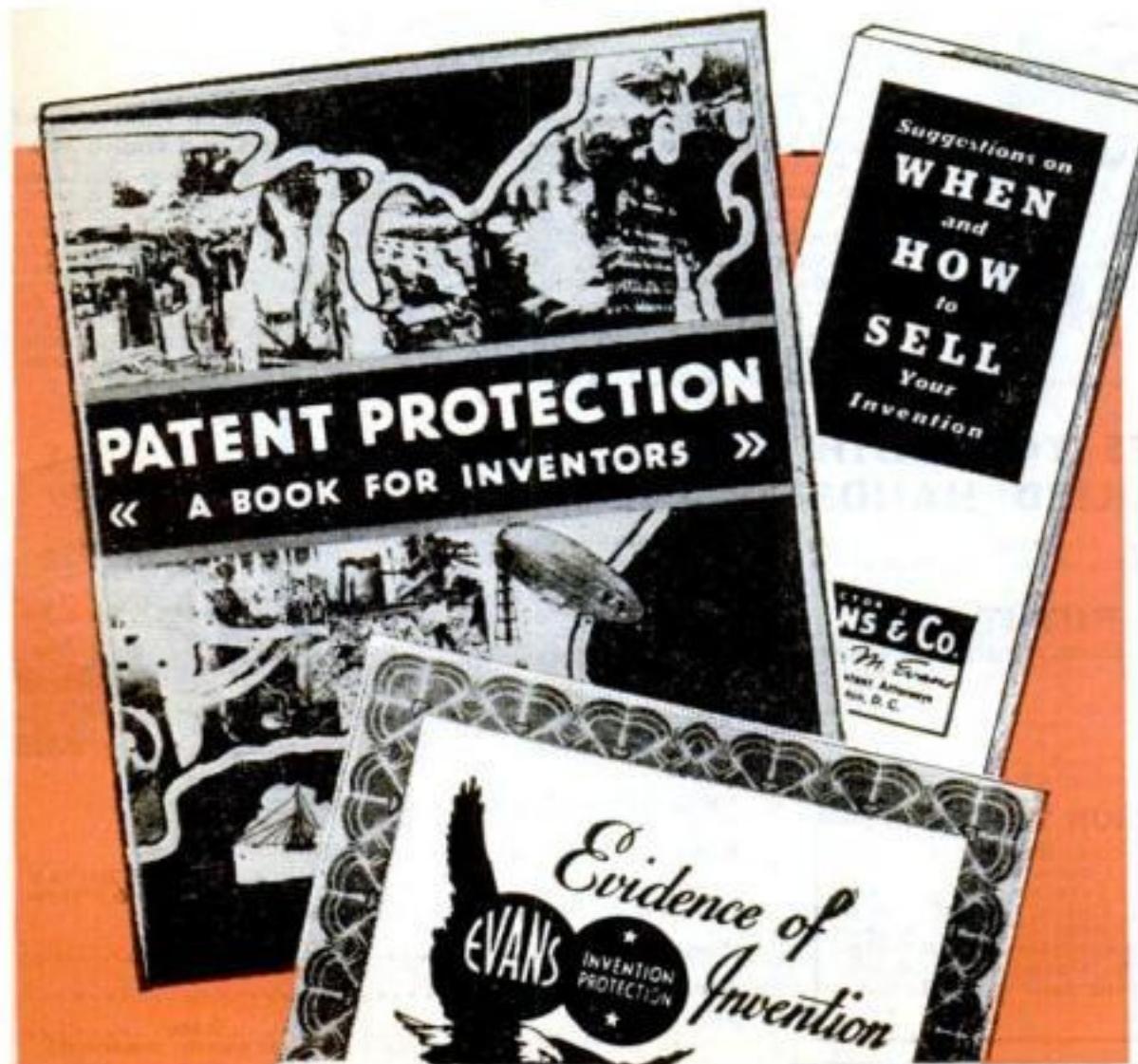
Get the facts about my training—now! Take the first important step toward the money-making future of your dreams. All features are fully explained in my big, illustrated FREE Catalog which comes to you along with another valuable FREE book you'll be glad to own. Mail Coupon AT ONCE!

ATTENTION VETERANS!

The Sprayberry Radio-Electronics Home Study Course has been fully approved for Veterans Training under the G. I. Bill of Rights. This is important to you! It's your opportunity to get complete Radio Training through Government grant. Find out about your eligibility AT ONCE!

INVENT

...THE TIME IS



HERE'S THE FIRST THING
TO DO...SEND FOR THESE
TWO FREE BOOKS

These TWO FREE BOOKS contain information that will guide you . . . tell you about pertinent Patent Laws and how they protect inventors like you . . . tell you about royalties, sale of patents, infringements . . . show you the procedure required by the United States Patent Office . . . illustrate 115 basic mechanical movements that may help you develop, improve or complete your invention. And they're yours for the asking. With the books we send "Evidence of Invention" form which may help establish the date of your disclosure to us in the event of another inventor filing application for the same invention.

TOORS RIPE FOR Action!

You men . . . you women . . . with ideas for patentable inventions . . . OPPORTUNITY IS KNOCKING! American industry WANTS your ideas for new products . . . new processes, time-and-labor-saving devices to offer to a public with money to buy such products. You see evidence of this every day in the newspapers . . . MANUFACTURERS ACTUALLY ARE ADVERTISING FOR IDEAS! And they want them NOW!

Don't wait! Get going now! Have your patent applications prepared and prosecuted just as quickly as you can. Remember—most manufacturers will consider an invention ONLY if you have taken steps to protect it with a patent.

HOW WE HELP INVENTORS

For nearly 50 years, Victor J. Evans & Co. has helped inventors secure strong patents. Our experienced staff of Registered Patent Attorneys, searchers, draftsmen, specification writers . . . does all the work for you . . . makes the search, prepares the drawings for submission to the United States Patent Office, prepares all necessary papers, pushes the prosecution of your claim to a conclusion. Sure, you can do it yourself. But think of the lost time, the travel expense, the lost motion. Many successful inventors use . . . and recommend the services of an experienced patent attorney. Even the United

States Patent Office in Rule 17 of "Rules of Practice in the United States Patent Office" states in part . . . "An applicant or assignee of the entire interest may prosecute his own case, but he is advised, unless familiar with such matters, to employ a competent registered attorney or registered agent as the value of the patents depends largely upon the skillful preparation of the specifications and claims . . ."

You can't go wrong when you select Victor J. Evans & Co. . . . a firm that has helped inventors for nearly 50 years . . . to handle your patent application for you.

READ THESE COMMENTS FROM TYPICAL INVENTORS*

" . . . I wish to thank you for your kind cooperation, and assure you that if I or any of my associates are in need of a patent lawyer in Washington, we will certainly recommend your services . . ." D. C. M.

" . . . I wish to thank you for the Patent Papers just received, and wish to say that my dealings with you

have been satisfactory, and very pleasant. And, that the time may not be too far away when I may employ your services again . . ." F. T. F.

" . . . I wish to express my appreciation for your services and congratulate you upon the successful prosecution of this application . . ." J. R. H.

*Names and addresses upon request.

MAIL THIS COUPON
For Quick Action

VICTOR J.
EVANS & Co.

Merlin M. Evans

Registered Patent Attorney

Main Office: 140-A Merlin Building

Washington 6, D. C.

Pittsburgh Office: 521-C Empire Building

Los Angeles Office: 738-C Security Building

Rush by return mail free copies of your books, "Patent Protection" and "When and How to Sell an Invention"—also important—"Evidence of Invention" form.

NAME

ADDRESS

CITY and STATE

Get a good headstart in
**RADIO
AVIATION
or ENGINEERING**
with these tested books

1. INTRODUCTION TO PRACTICAL RADIO

By Tucker. Full explanations, in good plain English, of all fundamentals, including complete explanations of the necessary mathematics at the points where it is used. Many practical problems for training. All the instruction needed for the standard license exams, Eddy tests, etc.

\$3.00

2. PRINCIPLES OF RADIO FOR OPERATORS

By Atberton. Very easy-to-understand explanations of basic theory and all parts of radio, with many pictures and demonstrations. Uses the teaching methods devised for the Signal Corps and Navy Communications training. Contains exceptionally good material on antennas.

\$3.75

3. INTRODUCTION TO ELECTRONICS

By Hudson. Concise, clear explanation of all underlying theory with illustrated descriptions of the construction of the basic electronic devices and explanations of how they are used for power, in communications, telephotography, control mechanisms, and many other fields.

\$3.00

4. AERODYNAMICS

By Parkinson. Simply written explanations of all calculations used for lift and drag determination, airfoils, lift-increasing devices, measurement of performance, wind-tunnel tests, etc. Provides the essential data and theory for those in design, engineering, and testing departments of aircraft manufacturers.

\$2.25

5. ENGINEERING PREVIEW

By L. E. Grinter and Others. Fundamental training in all the basic sciences, mathematics, drawing, and the engineering principles basic to all fields—mechanics, electricity, heat, power, etc.

\$6.00

6. MAKING PATENT DRAWINGS

By Radzinsky. A well-known patent lawyer explains all the special techniques required for the drawings that must accompany patent and trademark applications. Shows how to avoid errors that might cause rejection by the Patent Office, gives step-by-step instructions for drawings for all types of patents.

\$3.00

Books are the least expensive road to advancement in technical and engineering jobs. Start now to acquire the knowledge you need for your chosen field with these tested books, easy to understand, written by experts. Use the coupon below to see these books for yourself without cost or obligation.

FREE EXAMINATION OFFER

The Macmillan Co., 60 5th Ave., N. Y. 11

Please fill my order for copies of the books checked by number below, with the understanding that my bill will be cancelled if I return them in 7 days.

1... 2... 3... 4... 5... 6...

SIGNED.....

ADDRESS.....

PS3

Do You Make Mistakes in English?

EVERY time you speak or write you show just what you are. Mistakes in English reveal you as a person who lacks education and refinement. Lack of language power prevents you from presenting your thoughts in the strongest possible way. No matter what you do, real command of English will help you to your goal. Stop making mistakes in spelling, punctuation, pronunciation. Increase your vocabulary.



WONDERFUL INVENTION

Only 15 minutes a day with Sherwin Cody's new invention—and you can actually SEE your English improve. It teaches by HABIT—makes it easier to do the RIGHT way. Wonderful self-correcting lessons include spelling, punctuation, grammar and expression.

FREE BOOK ON ENGLISH

Lack of language power may easily be costing you thousands of dollars every year. See what Mr. Cody can do for you; it costs nothing to find out. Mail a postal card or letter this very minute for free book, "How You Can Master Good English in 15 Minutes a Day." It will prove a revelation to you. WRITE NOW. Address:

Sherwin Cody School of English, 181 B&O Bldg., Rochester 4, N. Y.

THERE'S MONEY IN CARTOONS!

RAYE BURNS will teach you HOW to CREATE ORIGINAL CARTOONS at home that you may SELL! Course contains 26 lessons and over 600 illustrations. All for Only.. \$2.85

Send name and address for free details.

RAYE BURNS SCHOOL, Dept. S, Box 3583, CLEVELAND, OHIO

FENCING EXCITING FUN HARMLESS

NEW—Clean—Healthful Develops Strong Body—Alert Mind. Become best swordsman in your neighborhood. FREE BOOKLET (with foils) teaches Quickly—Easily. HARMLESS because the 3 ft. Spring Steel Foils (swords) have safety rubber buttons. Complete outfit 2 Steel Foils (swords) and FREE Instructions. Now Only \$1.98 postpaid. MAIL CHECK or M. O. today. Add 28c for Foreign Postage.

LEE PRODUCTS CO., 1613-G First Ave., New York 28, N.Y.

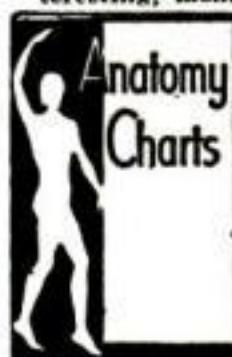
Learn this Profitable Profession



IN 90 DAYS AT HOME

Money-Making Career Open to Men and Women, 18 to 50

Hundreds of men and women between 18 and 50 make \$10 to \$20 in a single day giving scientific Swedish Massage and Hydro-Therapy treatments. There is big demand from doctors, hospitals, sanatoriums and clubs. Graduates earn large full time incomes from these or in private practice in their own offices. Others make good money from home treatments given in spare time. Learn this interesting, money-making profession in your own home, through our home study course. Same instructors as in our nationally known resident school. You can win independence and prepare for future security by qualifying for your Diploma. Course can be completed in 3 to 4 months. Many earn while they learn. Begin your training at once.



Anatomy Charts & Booklet FREE

Enroll now and we will include, at no extra cost, many needed supplies. Fit yourself to help meet growing demand for Scientific Swedish Massage. Send the coupon at once for complete details, Anatomy Charts and 32-Page Illustrated Booklet, FREE, postpaid.

THE COLLEGE OF SWEDISH MASSAGE

Dept. 670A, 100 East Ohio St., Chicago 11, Illinois

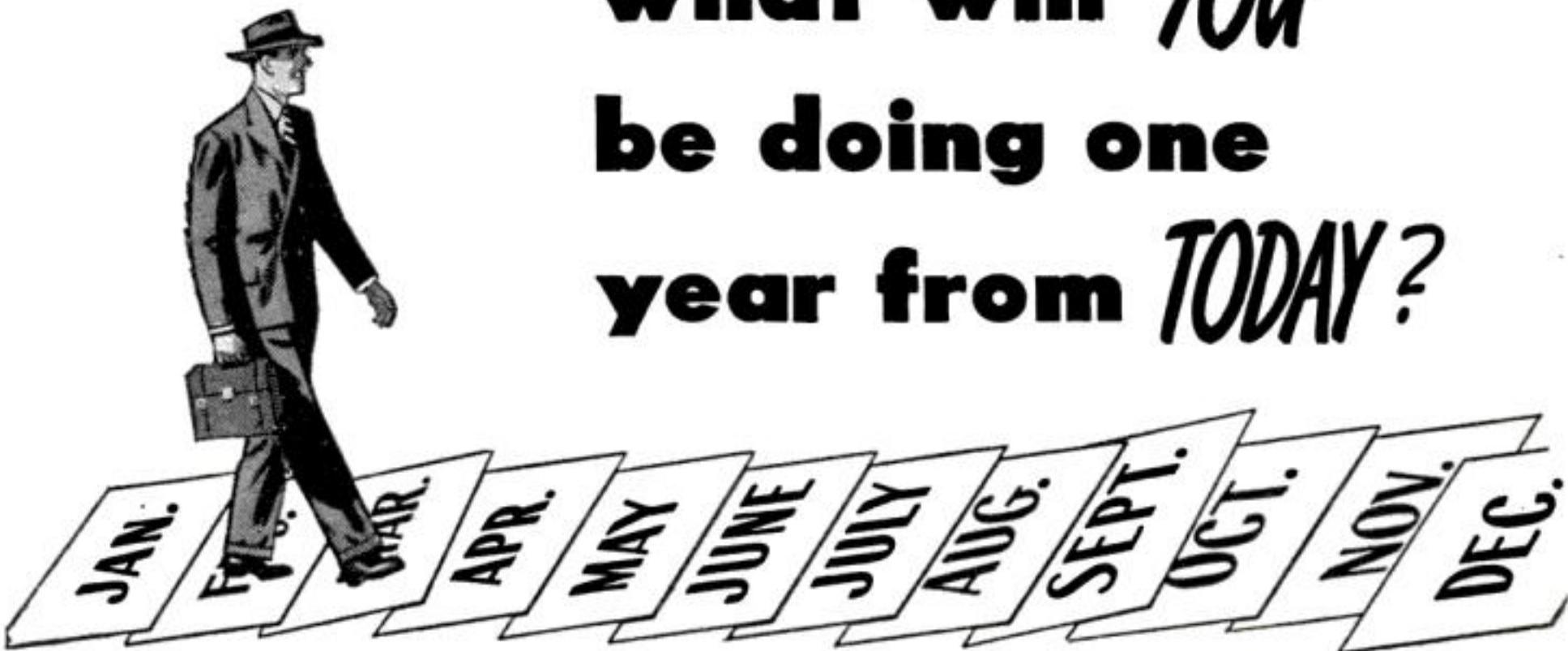
Please send me FREE and postpaid, Anatomy Charts, 32-page Booklet and complete details on Home Training.

Name.....

Address.....

City..... State.....

what will **YOU** be doing one year from **TODAY?**



YOU'RE too smart to stay in the same old job rut! You know that you have one life — that's all. So you've thought about *doing* something that would advance you in your work, increase your income.

The time to get started is *now*. And you can take the first step toward Personal Success this very minute! Just look over the coupon below and mark the I. C. S. Course in your field of interest. Then mail it — *today!*

We'll send you complete information on the International Correspondence Schools, and how they can give you the training you need to get ahead faster. Cost is low, texts are easy to understand, and every student gets *personal* service. The time to "take steps" is RIGHT NOW!

INTERNATIONAL CORRESPONDENCE SCHOOLS



BOX 7645-L, SCRANTON 9, PENNA.

Without cost or obligation, please send me full particulars about the course *before* which I have marked X:

Air Conditioning and Plumbing Courses

- Air Conditioning
 - Heating Plumbing
 - Refrigeration Steam Fitting
- #### Chemistry Courses
- Chemical Engineering
 - Chemistry, Analytical
 - Chemistry, Industrial
 - Chemistry, Mfg. Iron & Steel
 - Petroleum Refining Plastics
 - Pulp and Paper Making
- #### Civil Engineering, Architectural and Mining Courses
- Architectural Drafting
 - Architecture
 - Bridge and Building Foreman
 - Building Estimating
 - Civil Engineering Coal Mining
 - Contracting and Building
 - Highway Engineering
 - Lumber Dealer
 - Reading Structural Blueprints
 - Sanitary Engineering
 - Structural Drafting
 - Structural Engineering
 - Surveying and Mapping

Electrical Courses

- Electrical Drafting
 - Electrical Engineering
 - Power House Electric
 - Practical Electrician
 - Practical Telephony
 - Telegraph Engineering
- #### Internal Combustion Engines Courses
- Auto Technician Aviation
 - Diesel-Electric
 - Diesel Engines Gas Engines
- #### Mechanical Courses
- Aeronautical Engineering
 - Airplane Drafting
 - Flight Engineer
 - Foundry Work
 - Heat Treatment of Metals
 - Industrial Engineering
 - Industrial Metallurgy
 - Mechanical Drafting
 - Mechanical Engineering
 - Mold-Loft Work
 - Patternmaking
 - Reading Shop Blueprints
 - Sheet-Metal Drafting
 - Sheet-Metal Worker

Ship Drafting

- Ship Fitting
- Shop Practice
- Steel Mill Workers
- Tool Designing
- Welding, Gas and Electric

Radio Courses

- Electronics
- Radio, General
- Radio Operating
- Radio Servicing

Railroad Courses

- Air Brake Car Inspector
- Locomotive Engineer
- Locomotive Fireman
- Railroad Section Foreman

Steam Engineering Courses

- Boilermaking
- Combustion Engineering
- Engine Running
- Marine Engineering
- Steam Electric
- Steam Engines

Textile Courses

- Cotton Manufacturing
- Rayon Weaving

- Textile Designing
- Woolen Manufacturing

Business and Academic Courses

- Accounting Advertising
- Arithmetic Bookkeeping
- Business Correspondence
- Business Management
- Certified Public Accounting
- College Preparatory
- Commercial
- Cost Accounting
- Federal Tax
- First Year College
- Foremanship
- French
- Good English
- High School
- Higher Mathematics
- Illustrating
- Motor Traffic
- Postal Service
- Salesmanship
- Secretarial
- Sign Lettering Spanish
- Stenography
- Traffic Management

Name.....

Age.....

Home Address.....

City.....

State.....

Present Position.....

Working HoursA.M. toP.M.

Canadian residents send coupon to International Correspondence Schools Canadian, Ltd., Montreal, Canada.

British residents send coupon to I. C. S., 71 Kingsway, London, W. C. 2, England.

DISCOUNT TO DISCHARGED VETERANS—SPECIAL TUITION RATES FOR MEMBERS OF THE ARMED FORCES

I'll prove I can make you, too,

TOUGH as a MARINE

*.... and add
Powerful POUNDS
and Vital INCHES of
DYNAMIC MUSCLE*

to your ARMS, LEGS
BACK, CHEST
and SHOULDERS

says
George F. Jowett
WORLD'S GREATEST
BODY BUILDER
..OR IT WON'T COST YOU A CENT!

Let me prove to YOU that you can put inches of dynamic muscles on your arms! Add inches to your chest! Broaden your shoulders and power-pack the rest of your body. I can do for you what I've done for thousands the world over, including many officers and men now in the U. S. and British Armed Forces!

GIVE ME 10 MINUTES A DAY!

I'll Show You My Secrets Of Body Building

I'll help you learn the "Progressive Power Method" through which I rebuilt myself from a physical wreck to the holder of more strength records than any other living athlete or teacher! No matter how skinny or flabby you are, you can learn my methods right in your own home. Through my proved secrets I show you how to develop your power, inside and out, until YOU are fully satisfied that you are the man you want to be. "The Jowett System," says R. F. Kelly, Physical Director of

Atlantic City, "is the greatest in the world!" If you want a physique that will inspire respect from men, and admiration from women . . . ACT LIKE A HE-MAN! Decide at once! The famous book, "Nerves of Steel—Muscles Like Iron" will be included FREE! Priceless for the strength fan! Full of photos of marvelous power-bodied men who will show you what Jowett has done for them and how he can do the same for you. Reach out . . . Grasp this Special Offer today!

PROVE TO YOURSELF IN ONE NIGHT!

Send only 25c for test Course, "Molding a Mighty Arm." Read it the evening it arrives—learn from experience the thrill you can give your muscles!

SEND FOR THESE FIVE FAMOUS
COURSES IN BOOK FORM

ONLY 25c EACH
or ALL 5 for \$1.00

Jowett Institute of Physical
Culture
230 Fifth Avenue
Dept. 930-B
New York 1, N. Y.

This
Book
Free!



BOOK WITH PHOTOS OF FAMOUS STRONG MEN
IF YOU MAIL COUPON NOW **FREE**



Jowett Institute of Physical Culture
230 Fifth Avenue, Dept. 930-B, New York 1, N. Y.

George F. Jowett: Your proposition looks good to me. Send by return mail, prepaid, the courses checked below, for which I enclose (). Include FREE book of PHOTOS.

George F. Jowett
Champion of Champions
□ All 5 courses for... \$1 □ Molding Mighty Legs 25c
□ Molding a Mighty Arm 25c □ Molding a Mighty Grip 25c
□ Molding a Mighty Back 25c □ Molding a Mighty Chest 25c
□ Send all 5 C.O.D. (\$1 plus postage.) No orders less than \$1 sent C.O.D.

NAME..... Age.....
(Please print plainly. Include Zone Number.)

ADDRESS.....

TRAIN FOR KEY JOB OR BUSINESS OF YOUR OWN

REFRIGERATION and AIR CONDITIONING

Millions of Older Units Need Expert Service. Big After-the-War Expansion Will Create Even More Opportunities. Approved for Veterans "G. I." Training

A key job—a successful business of your own—you can have either in this vital, war-hit industry. A serious shortage of service-experts exists in every branch. Big post-war boom will open thousands of new opportunities. Get ready for your big chance. We'll give you the practical training you need—at home—and in our big Chicago shops, largest and most completely equipped in the country. No advanced schooling needed. Our unique methods make everything easy to grasp. We've trained thousands. Pay as you go. Quit when you want to. Get the full facts without obligation. Write TODAY.

INDUSTRIAL TRAINING INSTITUTE

2150 Lawrence Avenue, Dept. P2-N, Chicago 25, Ill.

ACCOUNTANT BECOME AN EXPERT

Executive Accountants and C. P. A.'s earn \$2,000 to \$10,000 a year. Thousands of firms need them. We train you thoroly at home in spare time for C. P. A. examinations or executive accounting positions. Previous experience unnecessary. Personal training under supervision of staff of C. P. A.'s. Placement counsel and help. Write for free book, "Accountancy, the Profession That Pays."

LASALLE Extension University, 417 So. Dearborn St.
A Correspondence Institution Dept. 183-H, Chicago 5, Ill.

Learn BAKING At Home

Baking is one of America's high industries in wages. Nearly depression-proof. Thorough basic home course lays sound foundation. If you have aptitude, write for FREE BOOKLET, "Opportunities in Commercial Baking."



National Baking School, 1315 Mich. Ave., Dept. 1361, Chicago 5

Do you want

- ... to go to College?
- ... or to enter a Profession?
- ... or get an Office Position?

To get anywhere, you practically MUST finish High School FIRST. You can complete our simplified High School Course in SPARE time at home, as FAST as your time and abilities permit. Equivalent to resident school work—prepares you for college, pre-professional examinations, business, industry. Standard texts furnished. Diploma. Credit for H.S. subjects already completed. Single subjects if desired. Low tuition, easy terms. American School, Chicago, est. 1897—endorsed by educators. Finish your high school education NOW. Write TODAY!

High School Course at Home Many Finish in 2 Years

American School, Dept. H146, Drexel Ave. at 58th St., Chicago 37

Gentlemen: Send me FREE information covering special training in subjects checked below. No obligation on my part.

- High School Course
- Electronics, Industrial
- Architecture and Building
- Automotive Engineering
- Business Management
- Electrical Engineering
- Elec. and Gas Refrigeration
- Air Conditioning
- Railway Training
- Diesel Engineering
- Drafting and Design for Men and Women
- Plastics
- Private Secretary
- Mechanical Engineering
- Aviation
- Salesmanship
- Radio

Name.....

Address.....

Now Any AUTO REPAIR JOB Can Be a "Push-Over" for You!

**IN LESS TIME—
WITH LESS WORK—
AND MORE PROFITS!**

MoToR's new AUTO REPAIR MANUAL shows you how to service and repair ANY part of ANY car! Now you can lick even the toughest jobs when you have this amazing Manual to make your work easier!

Every job on every car built since 1935 is explained as simply as A-B-C. Clear, illustrated instructions lead you step by step. NOW you can tackle ANY job from carburetor to rear end—and do it quick, easy, right, the FIRST time! Just look up make, model, and the job in the quick index of MoToR's AUTO REPAIR MANUAL—and go to work!

ONLY Manual of Its Kind

No wonder this manual is used by the U. S. Army, Navy, trade and technical schools everywhere, and thousands of successful auto servicemen!

To make this great book possible, the engineer-editors of MoToR Magazine condensed all the meat from 150 official factory manuals for you. They dug out all the information you need; made sure *every word* is crystal-clear; and put "the whole works" into this one great, handy book!

MoToR's AUTO REPAIR MANUAL is a big book: 764 large pages, 8½ x 11 inches, bound in sturdy covers. Nearly 200,000 ser-

vice, repair, adjustment, replacement, tune-up facts on every car built from 1935 to 1945!

Over 1,000 Pictures!

More than 1,000 cutaway photos, diagrams, drawings, charts, SHOW you what the clear text TELLS you! No wonder thousands of men call this amazing book their Auto Repair "Bible"! No wonder it will save YOU countless hours of work—and help you make MORE MONEY from auto repairs!

See for yourself—without cost! —what a work-saver, time-saver, and "life-saver" MoToR's AUTO REPAIR MANUAL will be for you! TRY it FREE—for 7 days. Learn first-hand how it can pay for itself the first few times you use it!

**FREE
7-DAY OFFER
SEND NO MONEY**

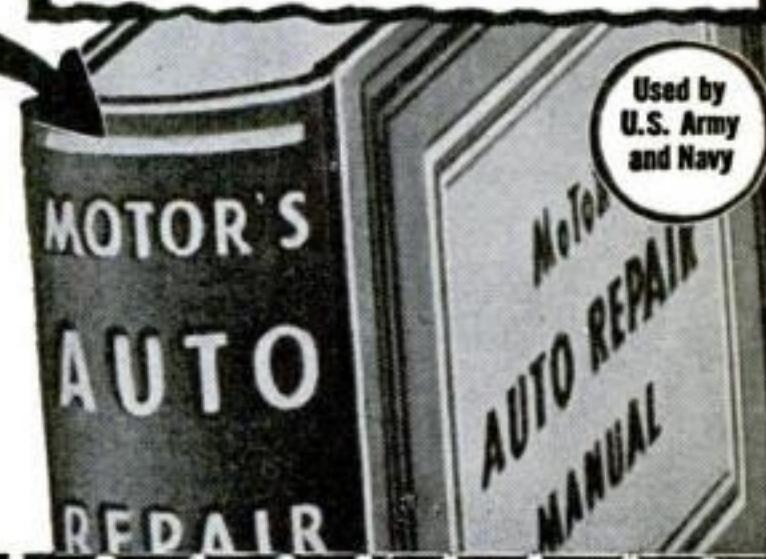


Clear, Pictured Facts on Every Job on Every Car Built Since 1935!

Nearly 200,000 service and repair facts on all these makes:

American	Crosley	La Salle	Packard
Bantam	De Soto	Lincoln	Pierce
Auburn	Dodge	Lincoln	Arrow
Austin	Ford	Zephyr	Plymouth
Buick	Graham	Mercury	Pontiac
Cadillac	Hudson	Nash	Reo
Chevrolet	Hupmobile	Oldsmobile	Studebaker
Chrysler	Lafayette	Overland	Terraplane
Cord			Willys

764 big pages; including 50 pages of carburetor text, charts, illustrations covering all models. Over 500 charts, tables: Tune-up Chart; Valve Measurements; Compression Pressure; Torque Wrench Reading; Starting Motor; Engine Clearances; Generator; Clutch & Brake Specifications; Front End Measurements, etc.; Engines; Electric, Fuel, Cooling, Lubricating Systems; Transmissions; Universals; Front Ends; Wheels; Rear Ends, etc.



Just mail coupon below—with-out money! When the postman brings your book, examine it thoroughly. Make it show you what it's got! Unless you agree this is the greatest time-saver and work-saver you've ever seen—return book in 7 days and pay nothing. Mail coupon today! Address: MoToR Book Department, Desk 2A, 572 Madison Ave., New York 22, New York.



Same FREE 7-Day Offer Applies on MoToR's Truck Repair Manual

For mechanics, truck specialists, service stations, fleet owners. Covers EVERY job on EVERY truck made since 1936! 1400 pictures, 914 pages, 300,000 facts. Used by Armed Forces. Warranted to contain every essential fact you need to know. Strong binding, size 8½x11.

Covers all types Gasoline Engines; Diesels and Hesselmanns. Fuel Systems, Governors, Lubrication Systems, Ignition Systems, Starters, Generators, Clutches, Transmissions, Axles, Torque Dividers, Transfer Cases,

Brakes, Steering, etc., etc. Also services buses, farm and industrial tractors, contractor and road building equipment, stationary power machinery, etc. (on all parts described in Manual.)

Offered on same FREE 7-Day examination as Auto Repair Manual. Check box in coupon at right.



Published by
MoToR, The
Leading Auto-
motive Business Magazine.
MoToR's manuals assure high
standards of repair work.

MoToR Book Dept., Desk 2A, 572 Madison Ave., N.Y. 22
Rush to me at once: (Check box opposite book you want)

MoToR's AUTO REPAIR MANUAL. If O.K. I will remit \$1 in 7 days, and \$1 monthly for 4 months, plus 35c delivery charge with final payment (\$5.35 in all). Otherwise I will return book postpaid in 7 days. (Foreign price, remit \$7 cash with order.)

MoToR's TRUCK REPAIR MANUAL. (Described at left.) If O.K. I will remit \$2 in 7 days, and \$2 monthly for 3 months, plus 35c delivery charge with final payment (\$8.35 in all). Otherwise I will return book postpaid in 7 days. (Foreign price, remit \$11 cash with order.)

Print Name..... Age.....

Print Address

City..... Zone No. (if any).....

State..... Occupation.....

SAVE 35c SHIPPING CHARGE! We pay postage. ENCLOSE full payment (check, money order, or postal note). Same 7-day return-refund privilege.



AUTO

BOOKS ON APPROVAL

SEND NO MONEY. Just mail the coupon for a complete set of Six Big Auto Books, 20th Edition. Whether you are a mechanic or helper, expert or apprentice, auto owner or driver, take immediate advantage of this FREE EXAMINATION OFFER.

**MAKE GOOD MONEY NOW
HOLD A PERMANENT JOB**

America wants its automobiles kept in good repair. Men with "know how" are in demand, at big pay. These books will help you get and hold an important job, or give you a chance to go into business for yourself now or later. Any man who half tries to improve himself can learn auto servicing and repairing by this quick reference method. Use the JIFFY INDEX to find easily understood answer to any auto problem. These wonder books prepared by eleven of America's great automobile engineers. Many hundreds of valuable illustrations. Send the coupon TODAY.

A year's consulting privileges with our engineers now given with these books without extra charge.

Vocational Publishers Since 1898

CAN YOU FIX IT?

These wonder books tell step by step HOW to make difficult repairs and adjustments, how to keep a car at maximum efficiency, including latest improvements in car design and operation. Engine troubles and how to correct them well covered.

6 BIG VOLUMES

2800 pages, 2000 illustrations, wiring diagrams, etc., including Diesel engines. Beautiful modernistic, washable cloth binding.

AMERICAN TECHNICAL SOCIETY, Dept. A120

Drexel Ave. at 58th St., Chicago 37, Ill.

I would like to examine your Six-Volume Set of Auto Books. I will pay the delivery charges only, but if I choose I may return them express collect. If after 10 days use I prefer to keep them, I will send you \$2 and pay the balance at the rate of only \$3 a month until \$24.80 has been paid. Please include consulting service as offered above.

Name

Address

City State

Please attach letter stating age, occupation, employer's name and address, and name and address of at least one business man as reference. Men in service, also please give home address.

INVENTORS

Do Not Delay

Have you ever been startled by seeing a successful article on the market, and exclaimed—"Why, I invented THAT 5 years ago—I didn't think it valuable enough to Patent!"

The Patent Laws were intended for the Protection of the Inventor, and the Inventor who slumbers on his Rights may wake up to find someone else reaping the reward that could have been his.

Write NOW for Information and Record of Invention form FREE. RANDOLPH & BEAVERS, Registered Patent Attorneys, Columbian Bldg., Washington, D. C.

PERSONALIZED SERVICE — REGISTERED PATENT ATTORNEYS

RANDOLPH & BEAVERS

905-L Columbian Bldg., Washington, D. C.

Please send me full particulars on Patents, fees, etc., and "RECORD of INVENTION" form—FREE.

Name

Street

City State

THIS AMAZING BOOK



FREE

CARTOONING

Contains money-making tips, ways of getting ideas, a list of cartoon buyers. Cartooning, Commercial Art and Portrait Painting may open up a vast new future for you. You can now enjoy the thrill of a cartoonist's popularity while earning. Our exclusive, revolutionary new inventions simplify and shorten students' training time. Look at these sensational features that you get: LAUGH-FINDER—COMIC CHARACTER CREATOR—MAGIC MARIONETTE, a sensational, yet simple device that will amaze you—also our new PORTRAIT COURSE just out—all at NO EXTRA COST. No previous art experience needed. 34 big lessons. Profusely illustrated. So simple even a sixth grade pupil can start learning first day.

FREE Send no money, just name. Get booklet, "How to Make Money With Simple Cartoons". Fascinating facts on your future in cartooning. Rush.

CARTOONISTS' EXCHANGE
Dept. 1441-D, Pleasant Hill, Ohio



TRI-STATE COLLEGE

B. S. Degree in 27 Months

Distinguished for technical 2½-year courses in Civil, Electrical, Mechanical, Chemical, Radio, Aeronautical Engineering; Business Administration, Accounting, and Secretarial Science. EX-SERVICE MEN can complete work here in shortest possible time. Special Prep. Dep't. Also REFRESHER COURSES, 36-Week Courses in Surveying, Drafting, Low tuition, Low living costs. Cosmopolitan student body. 63rd year. Enter Jan., March, June, Sept. Catalog. 516 College Ave.

ANGOLA, INDIANA

REFUSE TO GROW BALD

"GIVE YOUR HAIR A CHANCE" is the amazing book by J. W. KING, Sc. B. on dandruff, baldness, thinning and graying hair. Much usable information.—Ohio State Medical Journal. Best investment.—Science Education. Debunks hair fads.—Scientific American. Scientific fact.—Sunset Magazine. Without commercial bias.—Teaching Biologist. Book of a scientist.—Home Acres. Enormous assistance.—Pictorial Review. Practical.—Science News Letter. Send only \$2.00 today for postpaid copy of this authentic instruction, on how to save your hair. 6th printing. Prompt refund if not helped.

BRADNER PUBLISHING CO. (Est. 1933) Dept. 32, Cambridge 42, Mass.

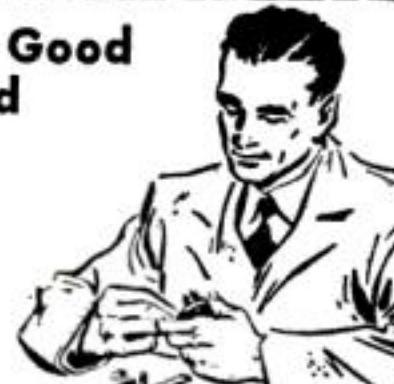


BE A WATCHMAKER

Enjoy Security and a Good Income in this Skilled Profession

There is a nation-wide demand for skilled watchmakers! You can prepare for a successful career by training at American School of Watchmaking. In this respected field you enjoy clean, light work in jewelry stores—many watchmakers establish businesses of their own. Millions of timepieces require frequent service—there is always a need for skilled men to handle these delicate instruments. American School of Watchmaking offers a fully accredited course, taught by experienced watch makers, with all equipment necessary to learn every phase of this profession. Now is the time to come to Los Angeles to prepare for a well-paid, permanent career as a watchmaker. Write for complete, illustrated booklet on this interesting field, and A.S.W. training.

AMERICAN SCHOOL OF WATCHMAKING
Division of American School of Aircraft Instruments
5247 W. San Fernando Rd., Los Angeles 26, Calif., Dept. S-9



VETERANS! SERVICEMEN!

Courses approved for Veterans Training under G. I. Bill.



AMERICAN SCHOOL OF WATCHMAKING

5247 W. San Fernando Rd., Los Angeles 26, Calif., Dept. S-9.

Gentlemen:

Please send me your illustrated booklet and complete information on the accredited A.S.W. Course in Watchmaking.

Name

Age

Address

City

Zone

State

Check one— Veteran In Service Civilian



Students learning to shoot trouble with modern radio analyzers in Coyne Shops.

**LEARN
RADIO-
ELECTRONICS**

In 12 Weeks
in the shops of **COYNE**

PREPARE FOR A GOOD JOB NOW

Don't be caught napping. Prepare in 12 weeks time for a good essential job now that will still be a good job with a real future now that the war is over. I'll help you finance most of your training if you are short of money. If you are not a trained man you may have to compete with millions of other untrained men. Get into a field that offers real opportunities in peace-times—good-times and bad-times. Radio-Electronics trained men are needed today.

Learn by Doing in 12 Weeks

We train you on a great outlay of Radio, Television and Sound equipment—on scores of modern Radio Receivers, Television apparatus, Sound Reproduction equipment, etc. We give you—RIGHT HERE IN THE COYNE SHOPS IN CHICAGO—the actual practice and experience you'll need in this great field.

Whether or Not You Have Had Experience Makes No Difference

A lot of men come to Coyne who have had a smattering knowledge of one or two branches of Radio. But they realize that they still need All-Around Training to get ahead in Radio-Electronics.

On the other hand, many of my students had no previous Radio or Electronics experience. So whichever is your case, you need Coyne training to get the better jobs and a real future.

VETERANS!
Coyne is also equipped to train those who qualify for training under G.I. Bill of Rights. Check coupon for special G.I. Bulletin.



INDUSTRIAL ELECTRONICS and ELECTRIC REFRIGERATION INCLUDED

Right now I'm including training at no extra cost.



The Home of Coyne

H. C. Lewis, Pres. Founded 1899

COYNE ELECTRICAL SCHOOL
RADIO-ELECTRONICS DIVISION
500 So. Paulina Street Dept. 16-4H CHICAGO 12, ILLINOIS

EARN While Learning

If you need part-time work to help pay living expenses while at school, we will help you get it. After you graduate, life-time employment service will be available to you. Every Coyne graduate also receives a Life Membership, with free technical and business service and privilege of review without additional tuition charge.

STUDENT FINANCE PLAN

Coupon will bring details of my Student Finance Plan . . . facts on how I help you "Earn-While-Learning" . . . information on FREE EMPLOYMENT SERVICE FOR LIFE. ACT NOW TO MAKE SURE YOU GET MY GENEROUS OFFER. Sending for this interesting free book can be your first big step to success.

GET MY BIG NEW BOOK

It tells all about my big Chicago shops and my plans to help you get ahead. Packed with facts and pictures of students at work in my shops. Mail coupon for this New Book now!



GET THIS
FREE BOOK

H. C. LEWIS, Pres., Radio-Electronics Div.,
COYNE ELECTRICAL SCHOOL
500 S. Paulina St., Dept. 16-4H,
Chicago 12, Ill.

Dear Mr. Lewis: Send me your Big Free Radio-Electronics Book and all the facts . . . also full details of your "Student Finance plan." Check if you are interested in information on the following:

- Send special G.I. Bulletin.
- Send physical disability details.

NAME.....

ADDRESS.....

CITY..... STATE.....



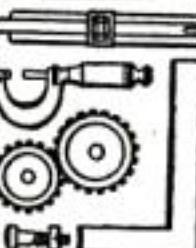
SUCCESS!

How to Get Along in this World

Here, gathered together for the first time, are 5000 gems of worldly wisdom on how to live joyously, successfully . . . how to handle people, make money, be happy. Written out of actual experience by the best brains of mankind . . . during the past four thousand years! To-the-point, workable instructions on getting ahead. Only \$1. Included are lessons on how to use these quotations in your daily life. Clip and mail coupon below for FREE details today.

Short-Cut Mathematics COMBINED WITH Practical Mechanics Simplified

Be a "master mind." Learn how to juggle figures, do baffling tricks with numbers. Add long columns of figures this lightning-quick, short-cut way. Multiply 4 figures by 4 figures without old-fashioned multiplication. Here are speedy, simplified systems used by stage "wizards," expert accountants, engineers. Only \$1. Course includes illustrations, problems, answers. Mail coupon below!



$$\frac{\div}{+} X = \sqrt{ }$$



SUPER JU JITSU Now.. get tough DOUBLE-quick!

Fear no man. The bigger they come the harder they fall. Super Ju Jitsu is easy to learn. Big illustrated self-instruction course shows you how to disarm, disable and capture an armed attacker—with only your bare hands! Get amazing details at once—mail coupon below.

MAGIC AND CARD TRICKS



HOW to PERFORM for FUN and MONEY
Mystifying stunts made easy. **Secrets of magic** revealed in new illustrated course. Teaches tricks with coins, handkerchiefs, balls, ropes, etc. Shows you how to protect yourself from card sharks . . . their card manipulations exposed! Get the "inside" information on baffling stage performances. Learn how to be a magician and entertain friends. Mail coupon for FREE details.



LEARN HOW TO HYPNOTIZE

Amazing lessons in simple, easy to understand language. How to select a subject—how to hypnotize by telephone—how to make money from hypnotism—mental telepathy—stage hypnotism—self hypnosis, how to use modern hypnotism to conquer inferiority complex, timidity, etc. Clear helpful pictures show operating positions, movements. Startling low price. Mail coupon for complete information—FREE.



how to write better letters

Make your letters CLICK! Learn to put warmth and sparkle into business and social correspondence. Practical brass-tacks instruction on writing successful job-getting application letters, exciting keen-witted friendly letters, etc. **ACTUAL EXAMPLES** show tested ways of packing your letters with vitamins. Fascinating details on request . . . FREE. Just mail coupon below today!

NELSON CO., Dept. 5A01, 1139 So. Wabash Ave., Chicago 5, Ill. Write today for complete details on any of these SELF-INSTRUCTION COURSES. Send coupon below for the world-famous copyrighted Success-Catalog—it's FREE, on request.

FREE details . . . mail coupon!

NELSON CO., Dept. 5A01, 1139 S. Wabash Ave., Chicago 5, Ill. Please send me—FREE and without obligation—illustrated Success-Catalog containing information about the course (or courses) I have checked below. No salesman will call.

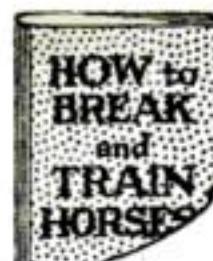
- Success
- Short-Cut Mathematics
- Super Ju Jitsu
- Magic and Card Tricks
- How to Hypnotize
- How to Write Better Letters

NAME _____

ADDRESS _____

CITY _____

STATE _____



THIS GREAT BOOK

FREE!

Every farmer, every lover of horseflesh should have a copy of it. This amazing book tells how to know horses—how to break them—how to train them—how to make money as a master horseman. Write for it today—**FREE**, together with my special offer of a course in Animal Breeding. If you are interested in Gaiting and Riding the saddle horse check here Do it today—now. You'll never regret it.

BEERY SCHOOL OF HORSEMANSHIP
Dept. 581 Pleasant Hill, Ohio

LAW . . .

STUDY AT HOME Legally trained men win higher positions and bigger success in business and public life. Greater opportunities now than ever before.

More Ability: More Prestige: More Money We guide you step by step. You can train at home during spare time. Degree of LL.B. We furnish all text material, including 14-volume Law Library. Low cost, easy terms. Get our valuable 48-page "Law Training for Leadership" and "Evidence" books FREE. Send for them NOW.

LASALLE EXTENSION UNIVERSITY, 417 South Dearborn Street

A Correspondence Institution Dept. 183-L Chicago 5, Ill.

SHORTHAND in 6 Weeks at Home

Famous Speedwriting system. No signs or symbols; uses ABC's. Easy to learn; easy to write and transcribe. Fast preparation for a job. Surprisingly low cost. 100,000 taught by mail. Used in leading offices and Civil Service. Write for free booklet. **Speedwriting**. Dept. 2601-6, 55 W. 42 St., N.Y. 18, N.Y.

LAW STUDY AT HOME for PERSONAL SUCCESS and LARGER EARNINGS. 36 years expert instruction—over 108,000 students enrolled. LL.B. Degree awarded. All texts furnished. Easy payments. Send for FREE BOOK—"Law and Executive Guidance."

AMERICAN EXTENSION SCHOOL OF LAW

Dept. 61-S, 646 N. Michigan Ave., Chicago 11, Ill.

DEVELOP THE POWERFUL INFLUENCE



FEUCHTINGER Method Guaranteed

IN YOUR VOICE

DO IT YOURSELF AT HOME

Write for the Voice Book · FREE

Sent only to those over 17 yrs of age

PERFECT VOICE INSTITUTE

STUDIO 1361 910 Kimball Hall Building, Chicago 4, Illinois

Learn

PORTRAIT PAINTING AT HOME



STUART STUDIOS.

• Previous art training or talent NOT necessary. This new Stuart System teaches you, in 11 simple, easy-to-follow lessons, to make exact charcoal and oil likenesses. Guidance for your every step. Send for free book today.

STUART STUDIOS, Room 281, 121 Monument Circle Indianapolis 9, Ind.

Please send me free book and outline of lessons.

Name.....

Street.....

City..... State.....

Now You can Use.



**YOU CAN BUILD 133
FASCINATING EXPERIMENTS.**

At home—in your spare time—you get real Radio experience from these many *interchangeable* Radio parts and sub-assemblies. DeForest's handy "Block System" eliminates unnecessary mechanical work; the convenient spring clip connections save a great deal of time. You quickly build Radio circuits that work. You experiment with Photo-Electric Cell "Magic" ... a 5 tube Superheterodyne Receiver ... a Radio Telephone, and scores of other fascinating projects. Little wonder learning Radio at home is so practical ... effective and real fun—with DeForest's modern "Home Laboratory."

YOU USE "LEARN-BY-SEEING" MOVIES!

Think of the pleasure, as well as help you get from the use of this DeVRY Motion Picture Projector and exciting "movie" TRAINING FILMS. You will be surprised how much faster ... easier ... Home Movies help you understand Radio-Electronic fundamentals. Here's a preferred training method of tomorrow—*yours today*. SEE the principles of what you're learning—in motion ... ANIMATED! See circuit actions otherwise hidden from the eye. You get this big Radio home training advantage—exclusively with DeFOREST'S. So act now! Mail coupon for complete details.



**DeFOREST'S
TRAINING, INC.
CHICAGO 14, ILLINOIS**

ALL OF THESE RADIO PARTS

to help you learn

RADIO

**FASTER-EASIER
AT HOME**

VETERANS!

Big things are happening at DeForest's for *veterans*! See how we can prepare you WITHOUT COST for a GOOD JOB or a BUSINESS OF YOUR OWN in the vast Radio-Electronic opportunity field.

See how DeForest's fascinating SHOP METHOD Radio Training at home can help you toward a good start in the Billion Dollar Radio-Electronic Field. Write for DeForest's BIG FREE book, "VICTORY FOR YOU!" that has helped many to good pay jobs. You'll be surprised at the opportunities ahead in F.M. Radio, Aviation Radio, Broadcast Radio, a Profitable Business of Your Own, Motion Picture Sound Equipment, Electronics—plus the exciting future possibilities ahead of Television, Radar, etc.

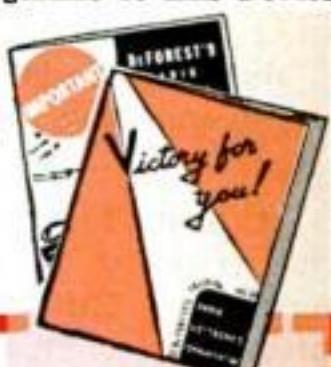
You Get "ALL THREE" With DeFOREST'S

Where else can you get such a combination of PROVED MAJOR training features as—(A) modern loose-leaf lessons prepared under the supervision of Dr. Lee DeForest, often called the "Father of Radio," (B) the use of "Learn by Seeing" home movie films and a genuine 16 mm. DeVRY

MOVIE PROJECTOR—and (C) eight big kits of "Home Laboratory" Radio parts to give you valuable practical Radio experience—at home.

You get an Effective Employment Service, too. Residential training in our Chicago laboratories also available.

DEFOREST'S TRAINING INCLUDES INSTRUCTION IN MOTION PICTURE SOUND EQUIPMENT, FM RADIO AND TELEVISION ...



DeFOREST'S TRAINING, INC., Dept. PS-C1
2535-41 N. Ashland Ave., Chicago 14, Illinois, U.S.A.

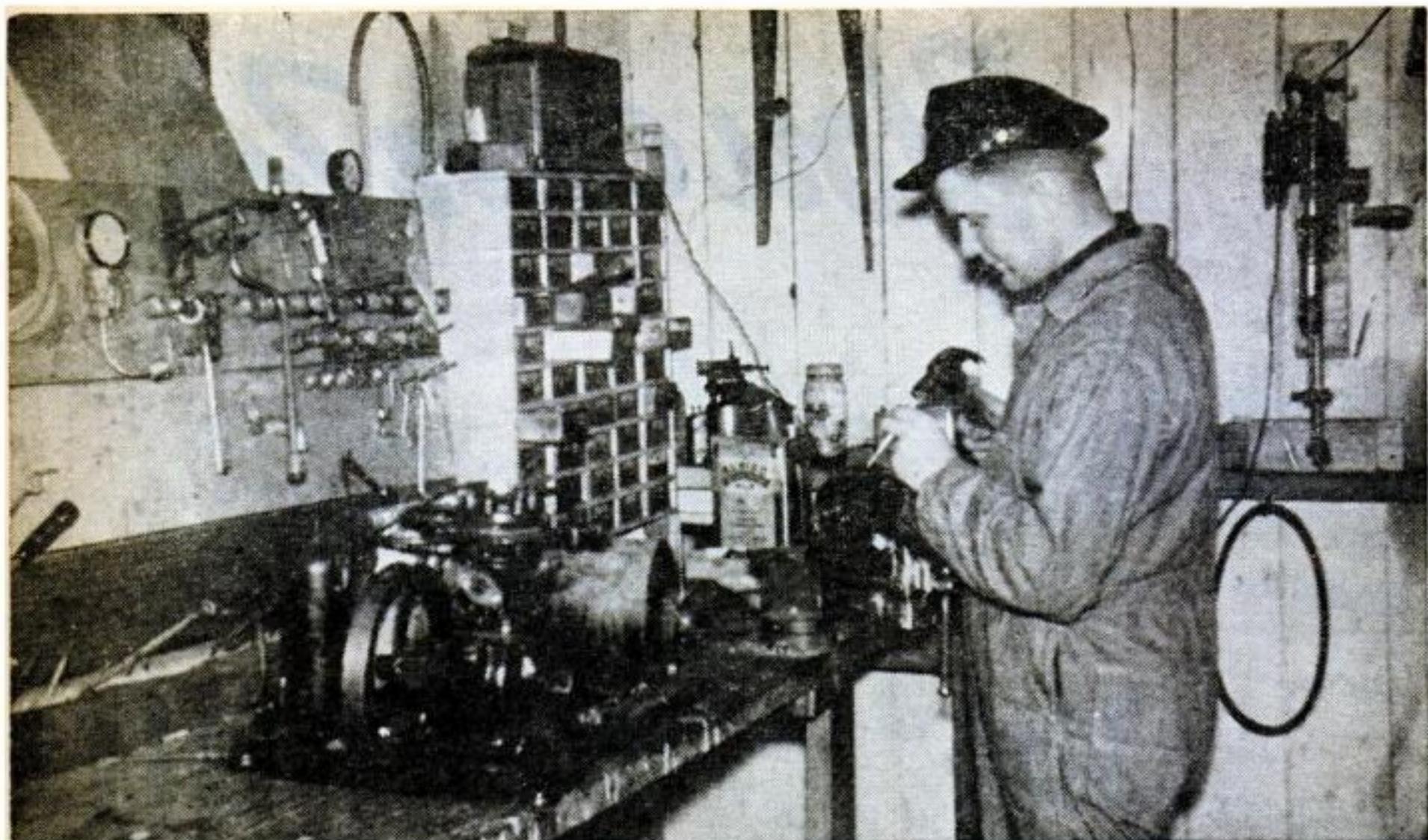
Send—FREE and WITHOUT OBLIGATION—illustrated book, "VICTORY FOR YOU" and KIT SUPPLEMENT, showing how Home Movies and Home Laboratory can speed my preparation for a place in the Radio-Electronics industry.

Name _____ Age _____

Address _____

Name _____ Zone _____ State _____

If under 18, check here for special information.
 If a discharged veteran of World War II, check here.



SO IT NEEDS FIXING

By S. T. CHRISTENSEN

the "Fix-it Man"

"WELL, I guess I'm the fellow to see, for I've repaired thousands of refrigerators (home and commercial both), vacuum cleaners, radios, washing machines, irons, fans, lamps, mangles, motors, etc. In fact, many of my customers call me their "electrical appliance doctor." And "doctoring," I might add has paid me a good substantial income for quite a few years. Funny, in a way, how I got started. Always liked to tinker and by experimenting around I found that most electrical appliances had many things in common. That, regardless of what the appliance was used for, or who the manufacturer was, the basic principles were much the same. From fixing my own appliances to fixing friends' and then for strangers at a fee, seems now to have been but a small step.

What to Charge?

At first, I let the owner decide the charge and, frankly, I was amazed at what I earned per hour. But then, when one figures what initial costs are involved in buying most electrical appliances, one can readily see that spending extra dollars for repairs is well worth while. Before long I was making more in my spare time repairing than from my regular job. The result . . . I went into business for myself. When war came, business boomed, for new appliances were not available.

For a while, repair parts (needed on some jobs) were a little difficult to get. But that

situation seems to have adjusted itself for many repair parts have today the high priority rating of AA2. After all, we must provide for the health and well-being of our civilian population.

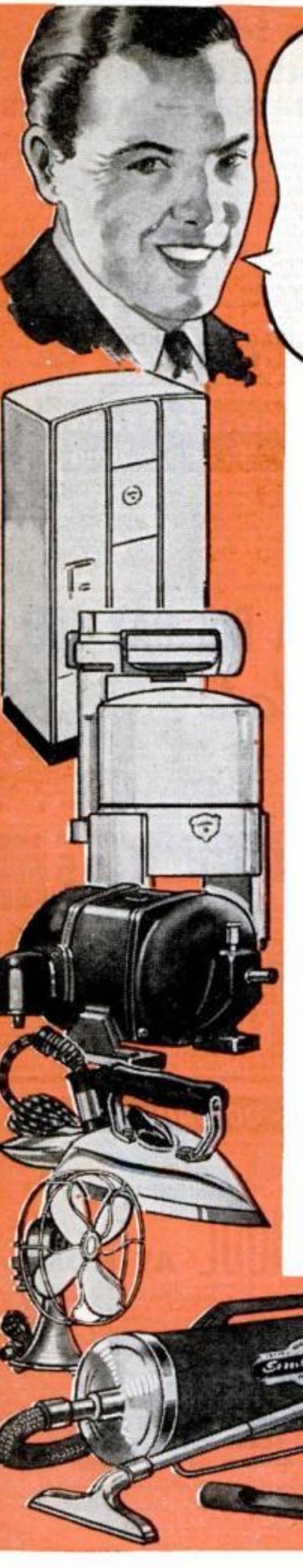
The Future Offers

Friends ask me about my future. And, I think I've got a grand one. Age is no handicap in repairing. I have in my files enthusiastic letters from repairmen ranging in age from 18 to 79 years. After the war, we're bound to see hundreds of new products on the market . . . products that the average person never dreamt of. These new products and our old appliances are all going to need at some time or other "fixing." Well, I'll still be the fellow to do it. The field open for appliance repairmen is unlimited. I don't worry at all about too much competition.

If You Are Ambitious

To the contrary, I've prepared a complete course, chuck full of simple, easy to understand photos and drawings and written in the same non-technical language as this article. I know the course is good, because I have hundreds of men all over the country writing to me telling me how the course has helped swell their pockets with cash. If you too want to prepare now for your future, I suggest you read the next page and send me the handy coupon."

ADV.



**BIG MONEY
INDEPENDENCE
A PROFITABLE
LIFETIME
BUSINESS
OF
YOUR OWN!**

LEARN ELECTRICAL APPLIANCE REPAIRING

PREPARE NOW FOR THE FUTURE

If now in war work, start your home appliance repair business NOW in your spare time and be set with a business of your own when the war is over. You don't need elaborate fixtures or expensive equipment to be a successful repairman. Operate from your garage, basement, vacant store, etc. Work as many hours as you wish—the home appliance repairman is his own boss. It is a profitable occupation for on many types of repairs it is not unusual for a repairman to charge on the basis of \$5.00 to \$6.00 per hour. Don't gamble with your future—learn a trade that will always support you. Remember, as long as electrical appliances are used, there will be a need for electrical appliance repairmen.

If you are at all mechanically inclined—can hold and use tools—then you have all of the qualifications required for becoming a big money earning home appliance repairman. It does not matter if you have not had a great deal of schooling or had previous experience along these lines—**WE WILL TEACH YOU.** Age should be no barrier—nor should any minor physical handicap.

New Course Tells All

Profusely illustrated, our new course shows you in simple, easy to understand language and drawings how to make each repair on refrigerators, vacuum cleaners, washing machines, motors, etc. Explains and gives you a working knowledge of electricity, welding, nickel plating, etc. Shows you how to build the power tools you need and how to solicit and keep business coming to you. Not a theory course but an honest to goodness course written by and used by repairmen the country over. Price of course is so low that the savings on your own household appliance repairs will quickly pay for it. Act now! Mail the handy coupon below today.

-----Read What Our Students Say About Course-----

I really believe your course the best investment a mechanically minded man can make.—Claude E. Allen, Indianapolis, Ind.

I have received your Course in Appliance Repairing and I must say I am well pleased with same. I am only sorry I did not have said Course some years ago. I have learned so much more through this course I would not part with it.—Charles Schwarz, Hamilton, Ohio.

The Course in Appliance Servicing arrived a few days ago. Want to take out a few minutes of my valuable time to let you know that this is just what I have been looking for ever since I opened up my Fix-It shop. I must admit that you told the truth when you said that it contains quite a bit more information than I bargained for. — P. J. Bretl, Sebring, Ohio.

I am a mechanic for the Western Union Telegraph Co. Three days after receiving the lessons in refrigeration I earned the exact cost of the course.—Henry S. Lee, Washington, D. C.

I work day times at the shipyard and after 4:00 P.M. I operate from my cellar and garage. I average \$10.00 to \$15.00 clear every day.—Walter Hanhy, Brockton, Mass.

GET STARTED TODAY—MAIL THIS COUPON

CHRISTY SUPPLY CO.
2835 N. Central Ave., Dept. D-3601
Chicago 34, Illinois

Please send me free illustrated literature about America's Fastest Growing Industry—**ELECTRICAL APPLIANCE REPAIRING.**

Name.....

Address.....

City..... State.....

ELECTRICIANS! RADIO MEN!

Valuable BOOK

FREE

**150
Wiring
Diagrams**

**It's My Gift to
Help You Get
Ahead**

HERE'S one of the greatest "get acquainted" offers ever made. This new book of 150 selected Electrical Shop Prints and Wiring Diagrams is YOURS — absolutely FREE.

This book is 'chuckfull' of valuable charts, diagrams, wiring methods and instructions for reading and using wiring shop prints. All the shop prints are full size 8½" x 11" with full explanatory information. Here's all you have to do to get this free book:

**150 Diagram Book Free
FOR MERELY EXAMINING
COYNE'S NEW 7 Volume Set**

To get your FREE copy of this Shop Print Book, all you have to do is to let me send you my complete new 7 volume set of electrical books—COYNE APPLIED PRACTICAL ELECTRICITY for 7 days' FREE examination. Here's a set of books written for the "beginner" or "old-timer" in electrical work who is anxious to get ahead.

This 7 volume set contains thousands of "show how" methods and photos—the latest information in "easy-to-understand language." Electricity from "A" to "Z" presented in new, practical, modern methods of explanation. A leader in electricity today must "know his stuff." To succeed from now on you must know many branches.

SEND NO MONEY You have to see this new 7 volume set to really appreciate how much it can mean to you and your future. I'll send you the complete set of 7 volumes (pictured below) at my risk, postpaid for 7 days' FREE Examination. I'll also send you the New Coyne Book of 150 Shop Prints and Motor Diagrams as my FREE gift to you TO KEEP REGARDLESS OF WHETHER OR NOT YOU DECIDE TO KEEP THE 7 VOLUME SET COYNE PRACTICAL APPLIED ELECTRICITY.

**Coupon is Not an Order
Just a Request to See the Books FREE**

YOU ARE NOT BUYING THE 7 VOLUME SET WHEN YOU SEND THIS COUPON. You are merely asking to see the books free for 7 days. The coupon only becomes an order if you decide to keep the 7 volume set after 7-Day Free Examination. OFFER IS LIMITED—Don't delay! Fill in and Mail FREE BOOK Coupon Now!



FREE BOOK COUPON

H. C. Lewis, Pres., COYNE ELECTRICAL SCHOOL, Dept. 16-R8
500 S. PAULINA ST., CHICAGO 12, ILLINOIS

Send me the NEW 7 Volume COYNE APPLIED PRACTICAL ELECTRICITY. Also send the Bound Volume of 150 Shop Prints and Diagrams which I am to keep FREE whether I keep the 7 Book Set or not. I'll either return the 7 Book Set in 7 days and owe you nothing or pay \$3 within 7 days and \$3.00 a month until \$21 is paid, or I'll send the cash price of \$19.75. You also include FREE one full year of Consultation service and technical bulletins.

NAME _____ AGE _____

ADDRESS _____

TOWN _____ ZONE _____ STATE _____

Check here if you want to pay postman cash price of \$19.75 (you save \$1.25) delivered. Same 7 day examination privilege and Money-Back Guarantee.

**Learn to Service
and Repair
ELECTRICAL APPLIANCES**

Learn to be a service mechanic on all types of electrical appliances . . . and prepare now for a permanent future, independence and security, operating a business of your own. You won't have to worry about losing your job when the next depression comes if you have your own electrical appliance repair business. There is always a demand for repair work . . . and it can't be done by a machine. Our practical, easy to learn home-training teaches you how to repair washing machines, vacuum cleaners, stoves, lamps, motors, irons, etc., and how to do house wiring. Also how to start your own business on little capital. Write today for FREE illustrated booklet which will explain in detail. No obligation. No salesmen will call.

PACIFIC TRAINING SCHOOL
4701 W. Pico, Dept. S-1, Los Angeles 6, California



Get into the vital meat industry. Concise, practical Home Training based on 25 years proven instruction methods used at National's famous resident school. Prepares you for bigger pay as Meat Cutter, supervisor, market manager or more money in your own store. Go as rapidly as your spare time permits. Diploma. Start NOW to turn your spare hours into money. Send for FREE bulletin today. No obligation.

National School of Meat Cutting Inc., Dept. O-38, Toledo 4, O.

**HOW TO GET A BIG PAY JOB IN
Real Estate**

Tremendous real estate boom predicted. Big-pay, permanent jobs or your own 6-profit business. Salaries up to \$2,500 to \$10,000 a year in property management, brokerage, appraisal, loans, insurance, building. Many make fortunes selling real estate. Thousands of trained men, women, required yearly by real estate firms, insurance companies, banks, Federal agencies. Rush post-card for 32-page QUIZ BOOK—mailed FREE with full details on new and only 5-volumes library MODERN REAL ESTATE PRACTICE! Lane Books, Dept. C-1, 100 East Ohio St., Chicago 11, Illinois.

**Correspondence Courses in
RADIO and ELECTRICAL ENGINEERING** **LOW AS \$25**

ELECTRICAL ENGINEERING. Get good grasp of wide electrical field. Modern. Very understandable. Theory made easy. **RADIO ENGINEERING.** Extra fine course in radio, public address, photo-electric work. Trains you to be super-service man, real vacuum tube technician. Tuition ONLY \$25, either course. Deferred payment plan. Servicemen needed badly.

Write for free copies of school catalogs, student magazines, etc. **LINCOLN ENGINEERING SCHOOL**, Box 931-S-85 LINCOLN, NEBR.

A SIMPLIFIED ART ANATOMY OF THE HUMAN FIGURE by Charles Carlson. The book they're talking about! One of the most informative books of its kind for both student and professional artists. Charts, notes, and over 350 drawings show detailed studies of every part of the body, posed and in action. **ONLY \$1 POSTPAID**

HOUSE OF LITTLE BOOKS, 80-B E. 11 St., New York 3



Fascinating vocation learned at home by those with aptitude. Thrilling pastime. National method brings out life-like colors. Free booklet.

NATIONAL PHOTO COLORING SCHOOL

1315 S. Michigan, Dept. 1361, Chicago 5

HIGH SCHOOL AT HOME

Most well-paid positions demand high school training. Without it, or equivalent, you can't advance to the full extent of your abilities in any trade, business or profession. Whatever your age, however you're situated, IT ISN'T NECESSARY TO STRUGGLE UNDER THAT HANDICAP. I.C.S., famous for more than 50 years, enables you to start your own high school in your own home. You're in a class by yourself—study in your spare time—acquire a high school education at astonishingly low cost. Authoritative texts! Rapid Progress! Write today for free booklet.

**INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX 7647-L, SCRANTON 9, PENNA.**

Send me full information on the following subject:

Name _____ Age _____

Home Address _____

City _____ State _____

Present Position _____ Working Hours _____ A.M. to _____ P.M.

LEARN AT HOME

PLASTICS

FABRICATION

New - Profitable Industry!



START YOUR OWN BUSINESS



MAKE PRODUCTS
LIKE THESE



YOU'LL really enjoy learning plastics this new, interesting way! For you'll actually make beautiful, useful plastics articles during your home study training with Plastics Industries Technical Institute

NOW'S YOUR OPPORTUNITY—Yes, the exciting age of plastics is here! Demands of war have caused phenomenal growth in the plastics industry—creating exceptional opportunities for those who know plastics. If you are a person with an eye to the future, you won't remain on the outside looking in—you'll want a choice position in the growing, expanding plastics field—or a plastics business of your own.

WE SUPPLY MATERIALS—For your interesting and practical work with plastics, we supply handsome, colorful, transparent rods, sheets and tubes of plastics from which you make useful, attractive creations. You saw, cement, machine, buff, form, dye, decorate, cast and laminate various types of plastics.

You also design your own plastics articles—develop your own ideas—express your originality. Earn money while learning.

A COMPLETE COURSE—This practical training in plastics fabrication is only one part of the Plastics Institute home study course. In addition, you learn about the many types of plastics, their manufacture, characteristics, properties and uses—intensive coverage of molding and mold design—testing and cost analysis—everything to help prepare you for your place in plastics.

START YOUR FUTURE TODAY—Mail the coupon below now! We will send you an interesting, illustrated free booklet with valuable information about plastics. We'll tell you how, at small cost, you can prepare for a future in this important industry while carrying on your present work. Don't put it off. Clip the coupon and mail it today!

VETERANS: ASK ABOUT G.I. TRAINING

NEW YORK

Dept. PS6-1, 122 E. 42nd St.

CHICAGO

Dept PS6-1, 221 N. La Salle St.

LOS ANGELES

Dept. PS6-1, 1601 S. Western

SPECIAL RATES FOR SERVICE MEN

Plastics

INDUSTRIES TECHNICAL INSTITUTE

Plastics Industries Technical Institute.

221 N. La Salle St., Dept. PS6-1, Chicago 1

Gentlemen: Please send me the booklet "World of Plastics" and information on your training program. I understand there is absolutely no obligation.

Name..... Occupation.....

Street..... Age.....

City..... Zone..... State.....

Veterans: Check for special information. If under 18: Check for special booklet.

Mail in Envelope or
paste on penny postcard

FREE BOOKLET

Send For It Today!

"I'll show YOU how to make yourself **COMMANDO-TOUGH**

...in double-
quick time



...OR IT WON'T COST YOU A CENT!"
says *George F. Jowett*

WORLD'S GREATEST BODY BUILDER

Let me prove to **YOU** that you can put inches of dynamic muscles on your arms! Add inches to your chest! Broaden your shoulders and power-pack the rest of your body. I can do for you what I've done for thousands the world over, including many officers and men now in the U. S. and British Armed Forces!

GIVE ME 10 MINUTES A DAY!

I'll Show You My Secrets Of Body Building

I'll help you learn the "Progressive Power Method" through which I rebuilt myself from a physical wreck to the holder of more strength records than any other living athlete or teacher! No matter how skinny or flabby you are, you can learn my methods right in your own home. Through my proved secrets I show you how to develop your power, inside and out, until **YOU** are fully satisfied that you are the man you want to be. "The Jowett System," says R. F. Kelly, Atlantic City, Physical Director, "is the greatest in the world!"

PROVE TO YOURSELF IN ONE NIGHT!

Send only 25c for test Course, "Molding a Mighty Arm." Read it the evening it arrives—learn from experience the thrill you can give your muscles!

SEND FOR THESE FIVE FAMOUS COURSES IN BOOK FORM

**ONLY 25c EACH
or ALL 5 for \$1.00**

**BOOK WITH PHOTOS OF FAMOUS STRONG MEN
MAIL COUPON NOW**



Jowett Institute of Physical Culture
230 Fifth Avenue, Dept. 930-A, New York 1, N. Y.

George F. Jowett: Your proposition looks good to me. Send by return mail, prepaid, the courses checked below, for which I enclose (\$1.00). Include FREE book of PHOTOS.

- George F. Jowett
Champion of Champions
- All 5 courses for.... \$1 Molding Mighty Legs 25c
 - Molding a Mighty Arm 25c Molding a Mighty Grip 25c
 - Molding a Mighty Back 25c Molding a Mighty Chest 25c
 - Send all 5 C.O.D. (\$1 plus postage.) No orders less than \$1 sent C.O.D.

NAME..... Age.....
(Please print plainly. Include Zone Number.)

ADDRESS.....

Get into Good Paying AUTO BODY and FENDER WORK



WRITE FOR FACTS

AUTO-CRAFTS DIVISION • UTILITIES ENGINEERING INSTITUTE
1314 BELDEN AVENUE, DEPT. 316X, CHICAGO 14, ILLINOIS

ELECTRICITY MEN NEEDED

Electricians are needed everywhere. Demand is growing. Good pay now and bright future for trained men in this live, expanding vocation. Learn at home, in spare time, from old established school. Write for FREE Bulletin. No obligation.

AMERICAN SCHOOL

Dept. EE146

Drexel at 58th St.

Chicago 37

MAKE MONEY CASTING AT HOME FREE FACTS SENT



Make hundreds of Plaster Casts, quick, easy. Sell output to stores, novelty shops, etc. Enormous profits. No experience. Very little capital needed. Start in basement, garage or workshop. Complete, simple instructions anyone can follow. Start now while merchants are begging for merchandise to sell. Rush PLASTIC ARTS STUDIOS, R. R. 5, Dept. 45, Muscle, Ind.

Big Money for Workers In Home or Shop



Licensed Concrete Specialists wanted. No experience needed. Make Colored concrete pottery without molds. New, low cost, patented method. Cemetery products, novelties, tiles, floors, etc. Basement leaksealing. Other big pay projects. Booklet, details free. Men only.

NATIONAL POTTERIES COMPANY
542 West Lincoln, Fergus Falls, Minnesota

LEARN MASTER MACHINIST MECHANICAL DRAFTING

Expert training on Lathes, Milling Machines, Shapers, Grinders, etc.—Mechanical Drafting, Blueprint Reading and Designing. Allied shops are completely equipped and modern. Approved for G. I. Training • Days, Evenings

ALLIED SCHOOL OF MECHANICAL TRADES
1332 South Michigan Avenue • Chicago 5, Illinois

RADIO, ELECTRONICS and YOU!

THERE are big rewards in the communications line for the Radio man who has the answers! Too, the equipment that has made Radio communication possible is functioning now in other rewarding fields. Electron tubes in industry promise a whole new World of Electronics. I. C. S. has a variety of Radio Courses and a great new standard Electronics Course. Write for booklet, pick your Course.

INTERNATIONAL CORRESPONDENCE SCHOOLS
BOX 7647-L, SCRANTON 9, PENNA.

Send me full information on the following subject:

Name..... Age.....

Home Address.....

City..... State.....

Present Position..... Working Hours..... A.M. to..... P.M.

GET INTO **RADIO** ELECTRONICS & TELEVISION NOW!

**Hundreds of Industries
Need Radio and
Television Men Now
and for Great
Future Demands**

The man trained in electronics is wanted not only in Radio and Television, but in Aviation, Transportation, Communications, . . . in the designing, engineering and operation of hundreds of industries today and for years to come. Learn how great the field is for YOU...How you may GET INTO BUSINESS FOR YOURSELF. Mail the coupon now.



Learn by Doing Use Real Radio Equipment Furnished With Your Course

Experience is the best teacher and you learn by experience with the National Shop Method of Home Training. You build a long distance, high fidelity, superheterodyne receiver—build many other circuits and conduct experiments with the big kits of standard radio parts included with your training at no extra cost.

Here is the kind of training that gives you a first hand knowledge advanced and approved means and methods. Not only do you understand the basic principles of the industry but you become expert with practical experience.

Send the coupon for detailed information on all the different departments of this course of training.

CHOOSE YOUR FUTURE

1. Radio is a \$6-billion business. Radar, just starting, already does \$2-billion a year.
2. Thousands of men needed for stations and communication companies—for operation and maintenance.
3. Half million jobs in Television right at start is the opinion of industrial leaders.
4. Limitless future in Electronics—in the home and industry.



"My latest offer was \$5,800.00 as Radio Photo Engineer . . . but I'm doing well where I am now engaged. I am deeply indebted to National." — Joseph Grunich, Lake Hiawatha, New Jersey.

"Due to my training at National I was selected to instruct in the laboratory work of Navy and Marines." — R. R. Wright, Blackfoot, Idaho.



"I believe National offers the best course to be had. . . . Keep up the good work." — O. K. Ivey, Washington, D. C. Read what hundreds of other enthusiastic students have written about National Training. Send in your coupon today.

Get ready for Television and FM. Get your share of the Radio Service Business. Take your place in industry as an Electronics expert. Here is a **sensationally improved way** for you to get the right training. Study in spare time—odd hours, even minutes—and have the **advantage of actual shop experience** behind you.

This exclusive shop method of home training comes to you right from one of the world's greatest vocational educational centers—the resident training shops and experimental laboratories of the great NATIONAL SCHOOLS. It is sound, based on the actual experience of qualified instructors, engineers and technicians—men who are right in the industry.

National Schools has been training men for higher pay and greater opportunity for more than a third of a century. Fill out and mail the coupon below for details.

Grasp this Opportunity
Experts agree that Radio, Electronics and Television is right at the start of the greatest boom in

Shop Method Training Wins Good Jobs

history. Right now is the time to prepare yourself for BIG SUCCESS and LIFETIME SECURITY. Take part in the great expansion. The field is wide open.

You need no previous experience—no electrical or mechanical knowledge. National Shop Method Home Training is complete in itself—up-to-date.

Make use of your free time NOW to build yourself a great future. See how quickly you progress—how easy it is to get a firm, practical understanding of Electronics in all branches.

See for Yourself

Take the first step now. Fill out, and mail the coupon below. Be among the first to get into the big money—to win a position of importance—to have a BUSINESS OF YOUR OWN.

The industry is crying for trained men everywhere. It holds out rich rewards—a prosperous future. Well trained men ONLY are wanted.

Examine the National Shop Method of Home Training carefully in the quiet of your own home. Make up your own mind. No salesman from National will call on you. Fill out and mail the coupon today.



Learn for yourself just how easy this **SHOP METHOD HOME TRAINING** gives you the practical, down-to-earth experience you can never get from theory alone.

NATIONAL SCHOOLS

LOS ANGELES 37, CALIFORNIA EST. 1905



MAIL OPPORTUNITY COUPON FOR QUICK ACTION

National Schools, Dept. PS-1
4000 South Figueroa Street,
Los Angeles 37, California

(Mail this in an envelope or paste on a postcard.)

Send me FREE the two books mentioned in your ad including a sample lesson of your course. I understand no salesman will call on me.

NAME.....AGE.....

ADDRESS.....

CITY.....STATE.....

Include your zone number

Keep that "Car TICKING"



Every operator and mechanic needs AUDELS AUTO GUIDE.

This book saves time, money and worry. Highly endorsed. It presents the whole subject of auto mechanics:

- 1—Basic principles
 - 2—Construction
 - 3—Operation
 - 4—Service
 - 5—Repair
- Handy Size. Easily understood.

NEW FLUID DRIVE, HYDRAULIC SHIFT AND DIESEL ENGINES FULLY COVERED

Over 1500 pages—1540 illustrations showing inside views of modern cars, trucks and buses with instructions for all service jobs.

4 ASK TO SEE IT! — To Get This Assistance for Yourself Simply Fill in and Mail Coupon Today.

COMPLETE • PAY ONLY \$1. A MONTH ←

AUDEL, Publishers, 49 West 23rd St., New York
MAIL AUDELS NEW AUTO GUIDE for free examination. If O.K. I will send you \$1 in 7 days; then remit \$1 monthly until price of \$4 is paid. Otherwise I will return it.

Name _____

Address _____

Occupation _____

Employed by _____ P.S.M.

AVIATION Career

MAXIMUM TRAINING IN MINIMUM TIME

CAL-AERO TECH TRAINING will add dollars to your pay check all the rest of your life. Specializing in AERONAUTICAL ENGINEERING and MASTER AVIATION MECHANICS since 1929, Cal-Aero Tech training is carefully designed for just one thing—TO MAKE MORE MONEY FOR YOU. An alumni of over 6000 successful graduates proves our career training is unsurpassed.

VETERANS — Write us about Aviation Training, as provided under "G.I. Bill of Rights."

CAL-TECHNICAL  **AERO INSTITUTE**
MAJOR C. C. MOSELEY
PRES. SINCE 1929
FORMERLY CURTISS-WRIGHT TECHNICAL INSTITUTE
GRAND CENTRAL AIR TERMINAL
GLENDALE 1, CALIFORNIA
LOS ANGELES COUNTY

MAIL THIS COUPON TODAY!

Cal-Aero Technical Institute, Grand Central Airport, Glendale 1, California
Please send full information on Aviation Training FREE—without obligation. Dept. PS-1

Name _____ Birth Date _____

Street _____

City _____ State _____

Parks Offers Information On How To Prepare For Your Career In Aviation

Write for Parks' 64-page illustrated catalog describing how to prepare for your opportunities in Aviation.

For the past 18 years Parks graduates in Aviation Maintenance, Operations, and Aeronautical Engineering have continued to assume positions of Leadership in the Industry.

Parks training is on the college level leading to an accredited Bachelor of Science Degree.

You will find the answer to your questions of Aeronautical Career preparation by writing the College Registrar. He will send you, without charge, information of value to your future. Write today!

PARKS AIR COLLEGE
PS-115 • East St. Louis, Illinois



Get Started in Radio TEN "HOW-TO-DO-IT" BOOKS

Get a solid foundation in radio by means of these 10c timely text books. Each clearly written, profusely illustrated, contains over 15,000 words. You'll be amazed at the wealth of information packed into these handy books. Excellent for reference—ideal for technical library. Your money back if not satisfied.

**5 BOOKS FOR 50c
10 BOOKS FOR \$1.00
PREPAID**

- | | |
|--|-----------------------------------|
| No. 1—How To Make Four Doerie Short Wave Sets | No. 5—Beginners' Radio Dictionary |
| No. 2—How to Make The Most Popular All-Wave 1 and 2 Tube Receivers | No. 6—How To Have Fun With Radio |
| No. 3—Alternating Current for Beginners | No. 7—How To Read Radio Diagrams |
| No. 8—Radio for Beginners | |
| No. 9—Simple Electrical Experiments | |
| No. 10—Television | |
- Remit by check or money order—register letter if you send cash or stamps.
RADIO PUBLICATIONS, 27J West Broadway, New York (17)

RADIO ENGINEERING, Broadcasting, Servicing, Electronics, Aviation, Marine & Police Radio taught thoroughly. 48 weeks' Engineering course equivalent to 3 years' college radio work. Approved Veteran Training. Co-educational. Catalog upon request.
Valparaiso Technical Institute. Dept. 503 Valparaiso, Ind.



Begin today. Write now for our Free Book, "How to Become a Good Penman." It contains specimens and tells how others learned to write in spare time. Enclose 10c for your name beautifully written and a pen point suitable for shaded writing. Write today.
**THE TAMBLYN SCHOOL OF PENMANSHIP
N-439 Ridge Building, Kansas City, Mo.**

PLASTICS TRAINED MEN NEEDED IN NEW, ESSENTIAL INDUSTRY

Plastics is a great new industry and the time to get started in it is now. Opportunities are unlimited. In your spare time, at home, you can prepare to enter this important field. A new, practical training plan is now ready to help you realize your ambitions and win success. Send name and address today for FREE information.

**AMERICAN SCHOOL, Dept. P146
Drexel Ave., at 58th St., Chicago 37, Ill.**

Name _____
Street _____
City, State _____

Aviation's Urgent Need For Trained Men

LED TO THE ESTABLISHMENT OF

NORTHROP AERONAUTICAL INSTITUTE

(Division of Northrop Aircraft, Inc.)

Responsible, well-paid positions in civilian aviation are today seeking qualified men. The end of the war started a tremendous expansion in civilian air activities — air bases, repair stations, airline routes, and the production of peacetime aircraft. Aeronautical engineers, airline maintenance men, and aviation mechanics are *urgently needed*. But to qualify for these positions, you must have comprehensive, up-to-date training in the design, building, or servicing of the new *civilian aircraft types*.

This Modern Training Available

— To supply comprehensive training in civilian aviation, Northrop established the Northrop Aeronaautical Institute — a new school dedicated to the training and advancement of men for careers in aviation. As a Northrop student, you have *exceptional* advantages. You are located right on the mile-long Northrop air field, in new, especially designed buildings. You become an *actual part* of the Northrop organization, a great aircraft-engineering plant, with world-famous *research, engineering, and production facilities*.

sign — jet propulsion, gas-turbine aircraft engines, and advanced airframe types. In your aviation training, you get the benefit of this up-to-the-minute knowledge.

Progressive Educational Methods

— Northrop educational programs have already been proved through the training of thousands of Air Forces personnel and Northrop employees. In your training, you get the benefit of tested methods designed to train you thoroughly yet rapidly for the aviation career you choose. Your success in that career will depend, to a great extent, upon *how soon you start*. You now stand at the beginning of a great new era in the history of aviation... *a time of opportunity for men who plan a successful career*.

Learn New Aircraft Designs
Designer and builder of the deadly Black Widow P-61 night fighter, Northrop is a leader in aircraft de-



The Airplane and Engine Mechanic (A & E) is expert on service of all types of aircraft.



The Aeronautical Engineer plans the aircraft of the future.



The Engine Mechanic keeps commercial aircraft engines safe for flight.

"Dedicated to the Training and Advancement of Men for Careers in Aviation."

750,000 New Jobs...

Civil Aviation in the U.S. can provide more than 750,000 new jobs in the next ten years, according to the Civil Aeronautics Administration. The government agency also forecasts that more than 400,000 private planes will be in use in the U.S. by 1955.

Reported by Associated Press.



Northrop Aeronaautical Institute

Division of Northrop Aircraft, Inc.

1525 E. Broadway, Hawthorne, California

SEND COUPON FOR FULL INFORMATION

NORTHROP AERONAUTICAL INSTITUTE

1525 E. Broadway
Hawthorne, California

Please send me your free, illustrated booklet and information, including starting dates and tuition rates, on the training courses checked at right.

NAME _____ AGE _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Check one: Veteran In Service Civilian

Aeronautical
Engineer

Airplane Mechanic

Engine Mechanic

Master Airplane and
Engine Mechanic
(A & E)

Home-Study Course
Airplane & Engine
Maintenance

PS-2

BE READY FOR
A BETTER JOB
AT BIGGER PAY



PREPARE Now
FOR POST-WAR
BUILDING
BOOM

Thousands of
Trained Men
Will Be Needed

● New homes and other structures to be built after peace returns will provide a tremendous number of well-paid jobs. Men trained in Architecture, Drafting, Contracting, Carpentry and related building trades will cash in BIG on their knowledge and skill. YOU can train in spare time at home, at low cost, for a big-pay job in this rich field. American School can help you to success just as it has helped others during its 48 years. Check, fill in and mail coupon NOW for FREE information.

AMERICAN SCHOOL, Dept. B146, Drexel Ave. at 58th St., Chicago 37, Ill.

Send me FREE information about your special training plan covering subjects checked below.

- | | |
|--|---|
| <input type="checkbox"/> Architecture and Building | <input type="checkbox"/> Automotive Engineering |
| <input type="checkbox"/> Drafting and Design | <input type="checkbox"/> Diesel Engineering |
| <input type="checkbox"/> Contracting | <input type="checkbox"/> Mechanical Engineering |
| <input type="checkbox"/> Practical Plumbing | <input type="checkbox"/> Plastics Engineering |
| <input type="checkbox"/> Air Conditioning | <input type="checkbox"/> Aviation |
| <input type="checkbox"/> Refrigeration | <input type="checkbox"/> Radio |
| <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Business Management |
| | <input type="checkbox"/> High School Courses |

Name.....

Address.....

Learn REFRIGERATION-AIR CONDITIONING

FOR GREATER EARNING POWER

Trained men are needed for big paying jobs. Get in on the ground floor by starting now with the only civilian trade school selected for Army Training Program in this big, new industry.



Learn by doing actual work, with tools, on real machines, in our shops or train at home. In a few months you'll be a qualified REFRIGERATION SERVICE ENGINEER, ready for a big paying job or be your own boss.

FREE

BIG 16 PAGE BOOK OF VALUABLE INFORMATION

Tells all about the opportunities that await . . . of the tremendous growth and development of this industry. You can get in on the ground floor if you ACT NOW. Write Today!

Send Coupon TODAY!

ACT
NOW!
LEARN
IN YOUR
SPARE
TIME
AT HOME

ALL
DETAILS
SENT
FREE

Commercial Trades Institute, Dept. S-21
209 W. Jackson Blvd., Chicago 6, Ill.
200 S. 20th St., Birmingham, Ala.

Without obligation, please send me the facts. Let me judge for myself the opportunities and post-war security this training offers.

Check here if interested in GI training.

NAME.....

ADDRESS.....

CITY..... STATE.....

START YOUR OWN REFRIGERATION REPAIR SHOP!

Exceptional opportunity for men of all ages up to 60 who like to work with tools. Learn to be a service mechanic in REFRIGERATION. Our practical, thorough home training is easy to grasp in your spare hours with a common school education. Learn how to start your own business with \$50.00 worth of tools in garage, basement or small shop. Or take a well paid job in this active field.

FREE
Booklet

• Write for FREE BOOKLET today.

MECHANICS TRAINING SCHOOL
4701 West Pico Dept. S-1 Los Angeles 6, Calif.

Learn LANDSCAPE GARDENING

Prepare for the giant postwar home-building program. A thorough, interesting constructive home training for those who wish to become LANDSCAPERS, DESIGNERS, GARDENERS, etc., for profit or pleasure. Write today for FREE INFORMATION without obligation to

NATIONAL LANDSCAPE INSTITUTE

Dept. PS-1, 756 So. Broadway, Los Angeles 14, Cal.

ENGINEERING DEGREE IN 27 MONTHS

INDIANA
TECHNICAL
COLLEGE

Aeronautical, Chemical, Civil, Electrical, Mechanical, and Radio Courses, B.S. degree. 1-yr. diploma in Electrical, Mechanical, and Radio Service; Drafting, Prep courses. Gov't. approved for GI's. Low rate. Earn board. Large industrial center. Demand for graduates. Enter March, June, Sept., Dec. Catalogue. 616 E. Washington Blvd., Ft. Wayne 2, Ind.

Learn Penmanship

You can learn plain, rapid writing or fancy ornamental writing for social and business advancement, right in your own home during spare time by my Simplified Method. Write for my free book, "How to Become an Expert Penman," which shows what others have accomplished by taking my Courses. Send 10c for one of my favorite Pen Points and your name with a beautiful flourished bird written on a card. Write today.

T. M. TEVIS, BOX 25R, CHILlicothe, Mo.

Become a Doctor of PSYCHOLOGY

Win the degree of Ps.D. Teach the secret of contentment, happiness. Solve mental worries. Experience the revelation of truth. Chartered college. Individual help. Write for FREE book, COLLEGE OF UNIVERSAL TRUTH, 5153-A North Clark St., Chicago.

Photography for PLEASURE or PROFIT



Learn at home. Spare time. Practical basic training. Long-established school. Many have earned while learning. Send coupon below for free booklet, "Opportunities in Modern Photography" and full particulars.

AMERICAN SCHOOL OF PHOTOGRAPHY
1315 Michigan Avenue Dept. 1361 Chicago 5, Illinois
Send booklet, "Opportunities in Modern Photography," full particulars and requirements.

Name..... Age.....
Address.....
City..... Zone..... State.....



ELECTRICITY is one of the most important factors in RE-CONVERSION and this great field will continue to grow and become even more important! Thousands of trained Electricians are needed NOW. Why be satisfied with a no-future job when I make it SO EASY to prepare for a good war-time and peace-time job with a REAL FUTURE?

Learn ELECTRICITY 12 WEEKS TRAINING

Get into the fascinating, fast-growing, well-paid field of Electricity—a field that offers you opportunities and a future—in good times or bad times—a field that is a permanent necessity in war or peace. Here is your chance to prepare yourself for a lasting permanent future.

LEARN BY DOING

Here at Coyne—in a few short weeks, you can train for your Big Opportunity. "Learn-by-doing"—train on real electrical machinery.



**GET YOUR TRAINING
NOW... STUDENT
FINANCE PLAN**

Coyne Training is EASY, PRACTICAL! You LEARN BY DOING on real, actual machinery and apparatus. Don't let lack of money stop you. You can get training first—then pay most of your tuition after you graduate. If you need part-time work to help out with living expenses, I'll help you get it.

H. C. LEWIS, Pres.

COYNE ELECTRICAL SCHOOL
500 S. Paulina St., Dept. 16-73, Chicago 12, Ill.

VETERANS!
Coyne is also equipped to train those who qualify for training under the G.I. Bill of Rights. Check coupon for special G.I. Bulletin.

SPECIAL OFFER!

INDUSTRIAL ELECTRONICS
and
Electric Refrigeration Training Included



Not a correspondence course. Here you get all-around training in the many branches of Electricity, so you are equipped for the better jobs in this field.

Coyne training is easily mastered. Many of our students have never had previous Electrical experience—many others have had experience in one or two branches but realize to advance they must have all-around Electrical training. So whether you have had electrical experience or not—you need Coyne training. We also have facilities for men with physical disabilities, whether due to war or other causes. Check coupon for Special G.I. Bulletin.

INSURE YOUR FUTURE! Send for Book!

Coyne is 47 years old and has seen War and Peace—times of prosperity and times of national depression. During all these times Coyne has trained men for Good pay jobs. Coyne training is tested and proven. Mail coupon and let me send you the big free Coyne book and my complete story about how I help you get the training you need for a good Electrical job. This does not obligate you. Act at once. Just mail coupon.

H. C. LEWIS, President,
COYNE ELECTRICAL SCHOOL, Dept. 16-73,
500 S. Paulina St., Chicago 12, Ill.

Send me your Free Book and tell me about your plans to help me—including Student Finance and Radio-Electronics Training. Check if you are interested in information on the following:

- Send special G.I. Bulletin.
- Send physical disability details.

NAME.....

ADDRESS.....

CITY..... STATE.....

4 WAYS To Be Your Own Boss!

NOW, more than ever before, is the right time to start a small profitable business of your own... or train yourself for a practical money-making trade in which you can be **independent**. TODAY take your first step, without cost or obligation. Just mail coupon—and by return mail you will get full information on the courses listed here.

watch and clock repairing



Learn at Home—In Your Spare Time

Prepare for a happy future of prosperity, security... and get a big-pay job now. Fascinating, high-grade occupation. You can **EARN WHILE YOU LEARN**. Excellent field for part-time work at home.

Practical Course in HOROLOGY

Thorough self-instruction training in American and Swiss watches, clocks. Special sections on alarm clock repairs. Interesting. LEARN-BY-DOING instruction method. Learn **QUICKLY**, easily. No previous experience necessary. WATCHMAKING IS BASIC TRAINING FOR AIRCRAFT INSTRUMENT WORK and other scientific precision jobs.

Amazing Low Price! • Money-Back Guarantee! Get into this fast-growing field NOW... big opportunity... don't delay. Mail coupon below for **FREE** information. No obligation.

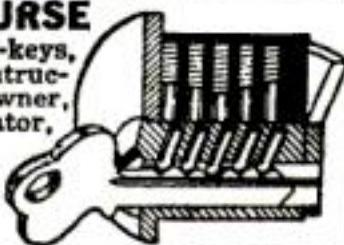
locksmithing and key making

PRACTICAL UP-TO-DATE COURSE

How to pick locks, de-code, make master-keys, repair, install service, etc. New, self-instruction lessons for every handyman, home-owner, carpenter, mechanic, service station operator, fix-it shop, hardware dealer, gunsmith.

53 Easy Illustrated Lessons

Low Price! Satisfaction guaranteed or money back. Write now... no obligation!



practical RADIO servicing



SELF-INSTRUCTION COURSE

Teaches you the practical side of radio... repair, adjustment, operation, alteration, trouble-shooting. No previous knowledge necessary. Large clear illustrations, diagrams, charts, etc. • **INTERESTING STEADY WORK!** Set up a radio repair shop of your own—or prepare for booming industrial electronics. This useful, how-to-do-it course brings you all the fundamentals, including mathematics, review questions, problems, answers. Strictly up-to-date. Low price. Coupon below will bring you full information you want immediately. Mail it in today!

MAIL ORDER BUSINESS

Your Big Opportunity!

34-lesson course on proved, tested, up-to-date, **profitable** methods. Amazing treasure-house of the best mail order plans and practices. How to start your mail order business on a small one-man scale... how to keep it growing more and more profitable month after month. Money-making FACTS. WRITE FOR COMPLETE DETAILS ON ANY OF THESE COURSES. Send coupon for World-Famous Copyrighted Success-Catalog—it's FREE!

NELSON CO., Dept. 3A01, 1139 S. Wabash Ave., Chicago 5, Ill.



FREE details... mail coupon!

NELSON CO., Dept. 3A01, 1139 S. Wabash Ave., Chicago 5, Ill.
Please send me—FREE and without obligation—illustrated Success-Catalog containing information about the course (or courses) I have checked below. No salesman will call.

- Watch and Clock Repairing. Locksmithing and Key Making.
 Practical Radio Servicing. Mail Order Business.

NAME _____

ADDRESS _____

CITY _____ STATE _____

STUDY AT HOME

With An Educational Institution

Men with specialized training win higher positions, insure larger earnings, and are bigger successes in business and public life. Opportunities NOW greater than ever before. Send for our Catalog.

ARTS and SCIENCES

Courses in Philosophy; Education; Letters; Public Health; Medical Jurisprudence; Psychology; Sociology; Physics; Chemistry; Plastics; Geology; Political Science; Theology; Business and Commerce; Accounting; Mathematics; Statistics; Agriculture.

ENGINEERING

Courses in Electrical, Civil, Mechanical, Drafting, Architectural, Steam, Aeronautical, Radio, Structural, Mining, Industrial, Petroleum, Marine, Chemical, Diesel, Automobile, and Air Conditioning Engineering.

LAW

Complete Professional Law Course includes 20 Hornbook Series college grade textbooks. Courses also in Commercial Law, Patent Law and Medical Jurisprudence.

McKinley-Roosevelt Incorporated, 4610-AB, Sheridan Rd., Chicago 40, Ill.

ARTISTS MAKE MONEY

Find out your ability. Send name, age, occupation and address for Free Vocational Art Test.

ART INSTRUCTION, INC., 1146 Art Instruction Bldg., Minneapolis, Minn.
(Formerly Federal Schools, Inc.)

STAMMER?

This new 128-page book, "Stammering, Its Cause and Correction," describes the Bogue Unit Method for scientific correction of stammering and stuttering—successful for 44 years. Benj. N. Bogue, Dept. 1881, Circle Tower, Indianapolis 4, Ind.

GET THIS
FREE
BOOK!



Wonderful, new device, guides your hand; corrects your writing in few days. Big improvement in three hours. No failures. Complete outline FREE. Write C. J. Oxment, 35-B St. Louis, Mo.

LAW

STUDY AT HOME for PERSONAL SUCCESS and LARGER EARNINGS. 36 years expert instruction—over 108,000 students enrolled. LL.B. Degree awarded. All texts furnished. Easy payments. Send for FREE BOOK—"Law and Executive Guidance."

AMERICAN EXTENSION SCHOOL OF LAW
Dept. 61-S, 646 N. Michigan Ave., Chicago 11, Ill.



MECHANICAL DENTISTRY AT HOME!

To make Crowns, Plates, Bridgework, etc., for Dentists. Easy practical way to learn mechanical dentistry at home in spare time. FULL EQUIPMENT OF TOOLS AND MATERIALS INCLUDED WITH COURSE. Low tuition. Easy terms. Write for FREE BOOK about this money making profession that is not affected by the machine age.

MCCARRÉ SCHOOL OF MECHANICAL DENTISTRY
Dept. 846
Philadelphia, Pa.

DRAFTING

SPRINGBOARD
TO SUCCESS!

Increased salary, larger responsibilities, a real career instead of just a job—these are to be had by the trained draftsman. I.C.S. makes the way to thorough, practical training open to you. Check up and you'll find that nearly every "big name" American in engineering and production acquired experience at the drafting board. Many of them started by writing for the I.C.S. free booklet. Send for it today! It can be the most important act of your life.

INTERNATIONAL CORRESPONDENCE SCHOOLS BOX 7647-L, SCRANTON 9, PENNA.

Send me full information on the following subject:

Name..... Age.....

Home Address.....

City..... State.....

Present Position..... Working Hours..... A.M. to..... P.M.

WHICH OF THESE Opportunities INTERESTS You MOST? ↓

● Today, choose the job you want—and prepare for it. Or if you are already engaged in the work you like best, start training now for quicker promotion. Acquire the knowledge that will help you to get ahead faster, make more money and have greater security.

American School, founded in 1897 as an educational institution *not for profit*, can help you to reach your goal just as it has helped others during the past forty-nine years. Check the coupon at right, add your name and address and mail it at once. The school will send you details on its training plan and outline of study prepared by specialists. There is no charge, no obligation, so send the coupon immediately.

AMERICAN SCHOOL

Dept. G146, Drexel at 58th Street, Chicago 37

CHECK, CLIP AND MAIL COUPON NOW

AMERICAN SCHOOL, Dept. G146, Drexel at 58th, Chicago 37, Ill.
Without obligation, Please send FREE and postpaid, bulletin and details of the Subjects checked.

- | | | |
|--|---|--|
| <input type="checkbox"/> PLASTICS ENG'R | <input type="checkbox"/> Accounting and C.P.A. | <input type="checkbox"/> Drafting and Design for Men and Women |
| <input type="checkbox"/> Refrigeration | <input type="checkbox"/> Bookkeeping | <input type="checkbox"/> Radio |
| <input type="checkbox"/> Architecture and Building | <input type="checkbox"/> Private Secretery | <input type="checkbox"/> High School |
| <input type="checkbox"/> Contracting | <input type="checkbox"/> Diesel Engineering | <input type="checkbox"/> Air Conditioning |
| <input type="checkbox"/> Practical Plumbing | <input type="checkbox"/> Surveying & Topographical Drafting | <input type="checkbox"/> Mechanical Eng. |
| <input type="checkbox"/> Automotive Engr. | <input type="checkbox"/> Sheet Metal Pattern Drafting | <input type="checkbox"/> Shop Management |
| <input type="checkbox"/> Aviation Drafting | <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Tool Making |
| <input type="checkbox"/> Aviation | <input type="checkbox"/> Electronics, Industr. | <input type="checkbox"/> Better Foremanship |
| <input type="checkbox"/> Business Mgnment. | <input type="checkbox"/> Electricity—Pract. | <input type="checkbox"/> Machine Shop Operations |
| <input type="checkbox"/> Railway Training | | |

Name Occupation

Address Age

City State

YANKEE DOODLE

YOU CAN LEARN TO PLAY YOUR FAVORITE INSTRUMENT

YES, if you can hum "Yankee Doodle", or any other catchy tune for that matter, and if you spend only a half hour a day following our Print and Picture instructions, in an amazingly short time you should be playing simple melodies.

It's a grand pastime learning music this easy home-study way. Instead of spending hours at tedious exercises, you *learn to play by playing* real tunes from real notes. You start with simple melodies. Gradually you go on to more difficult tunes. And soon you're delighted to find you can play many popular pieces by note. What's more, learning music this modern way is not only easy as A-B-C, but inexpensive, too—costs only 7c a day, no matter which instrument you select.

NOTICE!

Please don't confuse the U. S. School of Music method with any system of teaching music "by ear" or by trick charts. Our method teaches you to play by actual notes—not by any trick or number system.

If interested, send for our Free Booklet and Print and Picture Sample. See how easy it is to learn music in spare time, without a private teacher. U. S. School of Music, 81 Brunswick Bldg., N. Y. 10, N. Y.



FREE! Print and Picture Sample

U. S. School of Music, 81 Brunswick Bldg., New York 10, N. Y.
I am interested in music study, particularly in the instrument indicated below. Please send me your free booklet, "How to Learn Music at Home" and your Print and Picture Sample. (Do you have instrument.....)

Plano	Piano Accordion	Reed Organ	Clarinet
Guitar	Saxophone	Tenor Banjo	Trombone
Violin	Trumpet Cornet	Ukulele	Other Instrument

Name (Please Print)

Street State

City State

Check here if under 16 years of age.

SAVE 2c—Stick coupon on penny postcard.

START NOW TOWARD A FUTURE IN **REFRIGERATION and AIR CONDITIONING**

Refrigeration and Air Conditioning are among the giant industries of America. Such industries need men who KNOW. Many men servicing and installing equipment are making large incomes.

Spare Time Training

If mechanically inclined, get the training you need to qualify for experience installing & servicing Refrigeration and Air Conditioning in stores, offices, homes.

Then you should have no difficulty getting started in these great industries. As experience, tools and a personal following are acquired; you may find it practical, later, to start your own REFRIGERATION and AIR CONDITIONING SHOP.

Practical Interesting Training

You'll like our way of training—through capable home-study instruction followed by practice on actual equipment under watchful eyes of seasoned Refrigeration and Air Conditioning men in our shops. You'll get top-rate instructions—the easy way. So get the facts now—**FREE** of obligation. Write TODAY—SURE!

UTILITIES ENGINEERING INSTITUTE, Dept. 316
1314 W. BELDEN AVE., CHICAGO 14, ILL.
Please send me the Free FACTS about opportunities in Air Conditioning and Mechanical Refrigeration. I marked the one that interests me most.
 Air Conditioning Mechanical Refrigeration

NAME _____ Age _____
ADDRESS _____
CITY _____ Zone _____ STATE _____

Get Ready for Big After War Opportunities!

I Will Train You
at Home Until
You Get a GOOD
PAY JOB in
DRAFTING

Act now to get a better job with more pay and pleasant working conditions. Get into Drafting—the basic profession where all post war products will start. I will train you at home—give you experience—doing the same kind of jobs you will do with the best paying firms. I furnish instruments, drawing table and all equipment when you start. Write today for vital facts and **FREE** illustrated book. Give Age.

Engineer Dobe, Div. 21, Libertyville, Ill.

Be Your Own Boss . . . **GET INTO PLASTICS**



LEARN

Plastics

Fabrication & Casting
For Financial Security

START AT HOME—SMALL CAPITAL NEEDED

Start your own Plastics business . . . with small capital . . . at home. Grow with this giant industry as you increase your "know-how" and skill. Plan now for your own business or prepare for exciting post-war Plastics jobs. Our revolutionary teaching plan covers production phases of fabrication, casting, cementing methods, mold making, compounding, dyeing, etc. You actually work with many types of Plastics materials. We supply everything. Check information desired. Home Training. Resident Course in Plastics Eng. Send this ad with your name and address in envelope or paste on 1c postcard to Dept. P. S.

VETERANS: Check here for special information

PLASTICS TECH. SCHOOL OF AMERICA, INC.
5200 EUCLID AVENUE, CLEVELAND 3, OHIO

Good Handwriting

HELPS YOU WIN SUCCESS!

It's so important to write a good hand for business and social advancement. Poor illegible penmanship often causes costly errors and marks you for failure. Why write a poor hand? It's so easy to learn at home in spare time. Write for our new free booklet today. If you wish, send 10c for a penpoint suitable for shaded writing and your name beautifully written.

In Business Since 1895 THE TABLYN SCHOOL OF PENMANSHIP
H-439 Ridge Bldg., Kansas City, Mo., U.S.A.

Learn TOOL DESIGN

Now, as never before, draftsmen and tool designers are needed to redesign for peacetime reconversion. Qualify quickly. Many making \$100 to \$150 per week. More qualified men needed than available. Good pay jobs waiting. Rush name and kind of job wanted today for full free facts. State age.

OHIO INSTITUTE OF TECHNOLOGY, Box 282, Greenville, Ohio

GUITARISTS

— play professional—be outstanding — among musicians with your technique, use beautiful background for vocals. Play progressive Rhythm. Modernistic set. Runs. Breaks. Modulations. Introductions. Futuristic Chords. Notes, diagrams, fingering—ideal for electric or standard. \$3.00.

NICOSIA **Box 596** **Brooklyn 1, N.Y.**

Win SUCCESS in PHOTOGRAPHY

QUALIFY AT AMERICA'S LARGEST, OLDEST SCHOOL

Top-ranking experts coach you individually in Commercial, News, Portrait, Motion Picture or Color Photography. Learn at home or through resident courses in N. Y. Free book gives full details. Write TODAY!

NEW YORK INSTITUTE OF PHOTOGRAPHY

Dept. 5 10 West 33 Street New York 1, N. Y.

Electrical Training at Bliss

NOW OPEN TO VETERANS AND CIVILIANS AFTER 3 YEARS OF WAR TRAINING

BLISS

ELECTRICAL SCHOOL
A TECHNICAL INSTITUTE

Intensive 8 months residence course in fundamentals of industrial electrical engineering, including radio and electronics. Extensive laboratory practice in electrical measurements; testing power equipment; circuit tracing; wiring techniques; radio and industrial electronics; use of machine tools; motor construction; drafting. Basic training meets industry's requirements for engi-

neering aides, laboratory assistants; operating, production and maintenance technicians; customers' engineers; draftsmen.

Graduates hold responsible technical and executive positions in communications, power, manufacturing. Modern buildings, dormitories, dining hall, campus. Moderate cost. Enter Feb. 25, July 8, 53rd yr. Catalog. 101 Takoma Ave., Washington 12, D. C.



FIX ANY RADIO

Amazing New Invention



Complete plan, only **\$1.50**

In manual form, 8½x11". Trouble-shooting charts. Data on 346 radio tubes. 76 large job-sheets. 1,000 time-saving hints. Covers all receivers—new and old, portables, FM, etc. Developed by Beitman, noted engineer, teacher, and author. Order today; use plan this week. No risk.

FOR BEGINNERS OR EXPERTS

Learn quickly to repair all radio sets. New revolutionary different comparison picture-method simplifies radio servicing. No previous radio knowledge required. Introductory training included. Find any fault with ease. You can do expert radio work almost immediately. Repair radios in minutes instead of hours. Plan U.S. Copyrighted. Take advantage of this new invention.

NO EQUIPMENT NEEDED

You can fix any radio using a screw driver, pliers, and a piece of wire—no testers needed. Simple point-to-point picture suggestions tell you where to look for defects, how to test radio circuits and parts, and how to make the repair. You may try the plan for 10 days without any risk.

REPAIR RADIOS IN MINUTES

Read the introductory job-sheets, follow the step-by-step picture blueprints, and fix any radio in a matter of minutes. Do radio work for fun and profit. The complete simplified training is yours for only \$1.50, postpaid. 10 days no risk trial.

MORE HELP — IF NEEDED

Supplement your study, clear-up all hard problems, get ahead in Radio. A companion 19 lesson Practical Radio manual will give you added assistance, help you get ahead faster, present important facts in greater detail. Include this course-manual also in your trial order. See coupon →

RADIO MADE EASY

Let this unique plan with its easy-to-understand diagrams, simplified illustrations, hints, job-sheets, and practical examples teach you basic radio facts. Learn important shortcuts in radio trouble-shooting. Make easy tests without testers, trace the signal, measure voltage, within the hour after receiving the plan. Follow the comparison tests given on large trouble-shooting blueprints. Over 1,000 repair hints. Data on all tubes. Covers every radio set—new and old.



10 DAYS "NO RISK" TRIAL

Examine and use Simplified Radio Servicing plan for 10 days in your own home. Apply this technique and repair one or more radios. Then decide to keep this greatest radio training bargain, or return the material and get your money refunded in full. You take no risk.

No Risk TRIAL ORDER COUPON

SUPREME PUBLICATIONS, 9 S. KEDZIE AVE., CHICAGO 12, ILL.

Ship the following manuals to me for 10 days' trial under your money-back guarantee. I am enclosing \$..... full price. Ship Postpaid.

Simplified Radio Servicing @ \$1.50. Practical Radio Manual @ \$2.95. Complete manual as described. Companion Volume, 19 lessons.

Name: PSJ

Address:



Learn by Mail to Mount Birds

Animals, Game-Heads, Fish, Pets, to Tan Skins

Men, Boys!

Be a Taxidermist. Learn at home in spare time. Easily, quickly learned. Grand Fun. A wonderful, profitable hobby, for expert hunters, also for amateurs, even young boys. Mount wild-game, although wild-game is not necessary. Use common, domestic specimens, squirrels, pigeons, even frogs. This famous, reliable school in business more than 35 years. More than 300,000 delighted students. Think of that!

Hunters

Save Your Trophies — Have a Home-museum Be a Taxidermy Artist

You will be THRILLED and DELIGHTED. You learn QUICKLY, easily AT HOME. Your friends will be amazed. Hunters from near and far will bring their TROPHIES to be mounted. You can earn fine profits in spare time. Many students earn \$60 to \$100 a month, in season. Rush the coupon today, and learn all about wonderful taxidermy. DO IT NOW!

Save your own hunting trophies. Have a lifelong hobby. Have a home museum that you are proud of, and that makes you popular and well-known far and wide. BOYS, wild-game is not necessary. Use common specimens, squirrels, pigeons, owls, domestic birds and animals. It's wonderful. Inquire today. Kill fewer game-birds. Double your fun and pleasure.

Fun — Fascination — Profit

And so easily learned in spare time. Wild-game is growing scarce. Help preserve it. Shoot only a FEW fine ducks and other game-birds, MOUNT THEM for home and den, and have MORE FUN and PLEASURE than killing the legal limit every day. Help preserve the wild-game.

Remember you learn to mount expertly, birds, animals, game-heads, fish, pets, to tan skins and furs. Investigate! You will be delighted. Send for free book today. "Eat your trophies and have them too."

THE N.W. SCHOOL OF TAXIDERMY, 3391 Elwood Bldg., Omaha 8, Nebr.

FREE BOOK!

Yes FREE, 64 pages, with 100 unique pictures of taxidermy work. No other book in the world like this. It will amaze and thrill you. Ask today for your free copy. State your AGE.

Send the Coupon!

Write name plainly in coupon or margin, or a post card will do. Rush your request, as free books may be exhausted quickly. Decide now. Don't wait a moment. State your age.

FREE BOOK

Northwestern School of Taxidermy,
3391 Elwood Bldg., Omaha, Neb.
Send me your free illustrated book, "How to
Mount Game". Also tell me how I may learn
this fascinating art easily and quickly by mail.
No obligation. State your age.

Name Age

Address

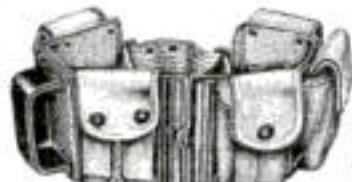


WAR

SURPLUS BARGAINS

★ ★ ★ ★ ★

SENSATIONAL VALUES FOR QUICK LIQUIDATION


**GI
POCKET
BELTS**

Of heavy canvas. Adjustable waist size. Each with 5 pockets and metal recoil fitting. Brand new. Fine for hunters, boy scouts, etc. A107

98c

BANDOLEERS


Army Bandoleers of heavy khaki. Used by hunters, boy scouts, etc. Slightly used but guaranteed serviceable.

A129-11
POCKET, EA.

49c


**MESS
KITS**

Regulation Army Mess Kits. Ideal for campers, boy scouts, etc. Slightly used but guaranteed perfect. Two pieces. Folding handle.

A-116 Each...

69c



Regular U. S. Gov't issue canteens. Plastic screw top cap chained to body. Slightly used.

A117-METAL BODY
Each.....

69c

A118-PLASTIC BODY
Each.....

69c

A109 Canteen Covers, New, Ea. 69c
A119 Canteen Covers, Used, Ea. 35c
A120 Canteen Cups, Used, Each 25c


U.S. GOVT BOLO KNIFE

Extra heavy. For farm, home or jungle use. Blade of gov't. formula cutlery steel. Walnut riveted handle. 3 1/2 inch hilt, 10 1/2 inch blade. You'll find hundreds of uses for a Bolo knife. Blade will take and hold a keen cutting edge. Weight 2 lbs.

A-112 with Army Sheath ...

\$4.95

A-212 Leather Sheath, extra...

\$1.50


PUP TENTS

Regulation Army Pup Tents of durable, brown canvas. Used, but in good condition. Fine for campers, outdoorsmen, boy scouts, etc. Grand Xmas gift for children.

A-1 Tent only

\$4.95

A-110 Tent, New \$7.95

A-101 Ropes, wooden poles and stakes for above. Per set... \$1.00


BIG SHIPS BELLS

Purchased from U. S. Maritim Comm. Measures 10 inches high, 9 1/4 inch flare. Big 6 inch clapper. Weight 15 lbs. Fine for farms, clubs, estates, etc. All new A-541, ONLY

\$9.85

PROF. TELEGRAPH KEY


Purchased from the gov't. Finest design and construction. Base measures 3x4 1/2 inches. Original value \$2.50. All parts of instrument brass. Adjustable.

A147—Each...

98c


SADDLE BAGS

Made of finest top grain leather. Rivet reinforced seams. Bottom and side gussets. Each canvas lined bag measures 12x13 inches. Fine for motorcyclists. May be separated to make two duffle bags. Used, but perfect.

A-151 Each.....

\$7.95



HOLD-E-ZEE SCREW DRIVER
Holds the screw for easy starting. Measures 4 1/2 inches long. Plastic handle.

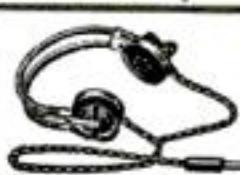
A-140—Each.....

23c


CATHODE RAY TUBE

Purchased from U. S. Gov't. for experimenters in electronics, radar, etc. Slightly used standard No. 5BP1 or 5BP4 with 5 inch screen. Each tube tested before shipment. Specify number when ordering. Tube list on request. Each, exp. collect...

\$12.00


**RADIO
HEAD-
PHONES**

Extremely sensitive with 4000 ohms resistance. Brand new and fully guaranteed. With moisture-proof cord and phone plug. A splendid value for the radio serviceman and experimenter.

A106-PAIR.....

\$2.95

New supersensitive phones.

A108-Pair

\$5.95

7 LB. RADIO PARTS ASSORTMENT


A "gold mine" for the radio serviceman. Hundreds of valuable radio parts, new radar and electronic parts and sub-assemblies, coils, resistors, trimming condensers — worth many times this low price.

A130R-7 LBS.

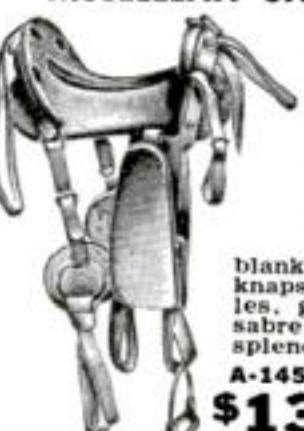
\$1.79

AMMUNITION BOX


Fine for storing valuables, carrying lunches, etc. Of heavy gauge 7 1/2 x 11 x 4 inches. Fireproof. Hinged lid with folding handle. Olive drab finish. Used, but perfect. A splendid value.

A-525 Each.....

25c

McCLELLAN SADDLE


Brand new! McClellan model saddles. Top grade cowhide with hair gerth, fender and 1 1/2 inch seat. Has straps for blanket roll and knapsack. Buckles, gunboot and sabre loops. A splendid value.

A-145—Each

\$13.95


27 LENSES, ALL NEW, PERFECT

For experimental work in optics. Consists of 27 precision ground and polished prisms and lens elements in assorted diameters and focal lengths. Big variety, positives, negatives, etc. Actual value over \$100.00.

A519—27 PIECES.....

\$7.95

50 LENSES, SEMI-FINISHED

Lenses similar to above but not polished. All are blanked and formed ready for polishing. Negatives, positives, and prisms in Crown and Flint glass. Worth many times this low price.

A520—50 LENSES, ONLY.....

\$1.95

COMB. AIR PILLOW-LIFE BELT


Every outdoorsman, hiker, camper, boy scout, etc., should have one. Made of air tight, waterproofed, rubberized khaki 10 x 40 inches when deflated. Swimmers, boatsmen, etc., use them as life-belt or beach raft. Quickly inflated or deflated. Folds compactly for storage. Used, but guaranteed perfect.

A-127 Each.....

98c

A144—Each

98c

A144—Each

98c

A144—Each

98c

OFFICERS WATCH COMPASS

Brand new gov't surplus. Army-Navy model. Single jewel mounted needle. Silver colored dial. A splendid value.

A-174—Each....

\$3.35


AVIATORS GOGGLES

U. S. Aviator goggles. Over-size design with sponge rubber shock lining. Curved lenses, elastic head band. Fine for industrial use, motorcyclists, etc. Hinged nose arch. Slightly used. guaranteed perfect.

A-149 Pair.....

\$5.95

MEDICAL STERILIZER


Consists of alcohol burner and sterilizing tray in hinged metal case 1 1/2 x 1 1/2 x 2 1/2 inches. Burner may be used separately. Bright nickel finish. All brand new. A125—Each.....

98c

ORDER DIRECT FROM THIS AD

Values galore! Hundreds of hard-to-find items for home, shop and outdoors. Make remittances by money-order, bank draft or personal check. Send 25% deposit on C.O.D. orders. No C.O.D.'s on orders for less than \$5.00. Include sufficient postage on parcel-post orders—any overage will be promptly refunded. All quotations F.O.B. Chicago. Used items and materials are guaranteed serviceable and as described. Your money back if not more than satisfied.

BIG ILLUSTRATED CATALOG FREE

STARK'S

Dept. PS146
509 So. State St.
CHICAGO 5, ILL.


NAVY SWEATERS

Genuine U. S. Navy 100% wool sweater. Pull over turtle neck style. Rib knit cuffs, waist and neck. Sizes 34 to 44. Ample warmth with medium weight.

A-137—Each.....

\$4.95



Extra heavy machetes. Has curved 15 in. blade, bone handle, 20 inches overall. Finest steel. A-171—Each.....

\$5.95

POPULAR SCIENCE



Classified Opportunities

Save time - Save Money

Classified Ads only 50c per word per insertion, payable in advance. Minimum ad 10 words. To be included in February issue copy should be in our office by January 1st. February issue on sale February 1st.

POPULAR SCIENCE MONTHLY—351 FOURTH AVE.—NEW YORK CITY 10

1 ADVERTISING

ADVERTISING Placed everywhere lowest rates. Reliable guidance on publications, expert assistance on ads without charge. Newspaper, magazine, mailing-list rate-book free. Chicago Advertising Agency, 20-MP West Jackson, Chicago 4.

24 WORDS in 64 Weeklies \$4.96. J. Darnell, 730 Hays, Jackson, Tenn.

SELL abroad, 50,000,000 prospects! Advertising instructions \$1.00. Tirekop, Box K-1, Madeira, Ohio.

ADVERTISE 24 words, 40 Newspapers \$3.50. List Free. Advertising Bureau, 4515-P Cottage Grove, Chicago 15.

SALES Letters by former Assistant Director of Correspondence at Sears Roebuck and Co. Write fully. Director, 1832 Stanwood St., Phila. 15, Penna.

INCH Display Advertisement Fifty Magazines, Year \$24. Wood's Popular Services, Atlantic City, N. J.

W ADVICE

DRUNKENNESS Is a disease which responds to treatment. Medical skill plus human sympathy prove successful with liquor and drug cases. 60 years experience. Write for free booklet. P. S. Nelson. The Keeley Institute, Dwight, Ill.

MAILORDER Business. Ready to operate. Includes everything needed for Beginners. Instructions, Circulars, Supplies: Books, Photos, Cards. \$1.00. Defiance, Lefferts, Box 121, Brooklyn 25, N. Y.

ARE You Up Against A Perplexing Situation? Do you need sound practical advice or ideas to help you in your business, industrial, social or personal problem? I can help you. Confidential. Send your question and dollar bill to Box 755PS, Station H, Los Angeles 44.

ADVICE—personal, education, domestic—confidential—send details with dollar bill. Guidance Center, 626 Park, Hastings, Michigan.

DARE to be somebody and get somewhere! See adv. under Education and Instruction. Personal Psychology, Inc., 1008-1009 Washington Bldg., Louisville 2, Ky.

2 AGENTS WANTED

SCHOOL Seniors—Sell classmates America's most beautiful, distinctive Graduation Name Cards. Positively highest commission. Largest selection. Lowest prices. Free cards and sample kit. Printcraft, 1423 E. Elm St., Scranton 5, Pa.

\$1 STARTS you in business. Sell DeLuxe five fold ties. 100% wool interlining. Costs you only \$7 per dozen, you make \$5 dozen. Send \$1.00 for special introductory offer two five fold ties. Catalog complete line Free. Phillip's Neckwear, 20 West 22nd St., Dept. K-46, New York 10.

GOOD Paying Business Silvering mirrors, plating autoparts, reflectors, bicycles, bathroom fixtures, etc., by late method. No tanks or shop required, outfit furnished. Free Booklet. Gunmetal Co., Ave. G, Decatur, Illinois.

LICK After-war layoffs; Start own business; home, office. Booklet describing "Collection of 127 Tested Plans" free. Elite Co., 214A Grand St., New York.

SCHOOL Seniors! A postal will bring you our Kwick-Sell Cardatalog of graduation name cards. Hot selling everywhere! Big Profits! Hurry! Craftcards, Box 235 (M), Pittsburgh 30, Pa.

EXCELLENT Sideline for Printing Salesmen. Decalcomania Name Plates in small quantities. Also, make money applying Initials on Automobiles. Free Samples. "Ralco", X-164, Boston (18), Mass.

FREE Water and our concentrates makes flavors, lotions, shampoos, 72 products, labels, bottles furnished. Qualco, F-20030 Russell, Detroit.

FREE! Latest issue Opportunity Magazine. Salesman's Guide. Inspiring, constructive. Shows how to earn money selling for others or in your own business. Hundreds postwar opportunities. Send name and describe what you have sold or are selling. Illustrated copy sent Free. Opportunity Magazine, 620 N. Michigan, Dept. 18, Chicago 11, Ill.

GOLD Lacquered Window Sign Letters. New Foils—Styles—Absolutely Beautiful. Free Samples. Atlas, 7941 Halsted, Chicago.

BIG profits taking subscriptions for all magazines. Agents' Confidential Catalog listing over 2500 periodicals and complete starting supplies Free. Pines Subscription Agency, Flushing, New York.

RAZOR Blades thousand \$5.75. Dolls dozen \$12.00. Pencils gross \$1.95. 1728 Bobby Hairpins \$3.60. Send payment. Catalogs free. Mills Sales Co., 901 Broadway, New York 3.

LUMINOUS pictures that glow in the dark. Large manufacturer wants factory representatives; wonderful new item; fast seller; free sample. Madison Mills, 303 Fourth Ave., N.Y.C.

START Your Own Business on our capital. Always your own boss. Hundreds average \$6,000 to \$25,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary to start. Wonderful opportunity to own pleasant, profitable business backed by world wide Industry. Write Rawleigh Co., Dept. A-U-PSC Freeport, Ill.

BLACKLITES, Fluorescent Lacquers, Inks, Dyes. Send for Catalogs. Keese Engineering Co., Santa Monica Blvd., Hollywood 46, Calif.

SELL "Petite Picture Notes." Something really different in greeting cards. Sample free. Dunbar Cards, New Brunswick 21, N. J.

50 ACTUAL photographs \$1.00, send for free samples, commissions. Artcraft Photo, 1600 Coney-Island Ave., Brooklyn 30, N. Y.

SALESMEN will be cleaning up in 1946 on our line of Electric Fans. Write Universal Fan Co., Peru, Indiana, Dept. 1.

SALESMEN Experienced, who would like to make up to \$75 commission weekly. Write Schutt Co., 243 East Ohio Street, Indianapolis 4, Indiana.

STRANGE "Dry" Window Cleaner. Sells like wild. Replaces messy rags, liquids. Simply glide over glass. Samples sent on trial. Kristee 121, Akron, Ohio.

MONEY-Making Opportunities—Free literature. Readers' Service, 640 Peoples Bldg., Charleston, S.C.

WAR Honor Scroll. All branches of service represented. 12 by 16. Space provided for name and photograph. Truly beautiful. Agents make big money. Sample 25c. E. Condon, Dept. 9, Upper Darby, Pa.

CLEVER Comic Everyday-cards Folders. Samples 25c. Greenacre 226½ W. Main, Springfield, Ohio.

START Exceptionally Profitable Home Rug, upholstery cleaning, mothproofing business. No machinery! Free instructions with first order. Sensational results. Enormous need. Extra double profits from fast sales of both products to housewives, stores, etc. Send for free sample. P. Torrey, 93 Federal, Boston.

25c WILL Bring You Hundreds of Propositions from firms who want agents. Tired of answering ads? Then try our way. M. L. Martin, Porter Bldg., Memphis, Tenn.

AMAZING New Zipper Shoe sells on sight. Big profits for salesmen. Leads line 200 splendid styles. Territories open. Get Free Sample Outfit. Write Consolidated Shoe, Dept. S-152, Chippewa Falls, Wis.

CALL On Friends with Greeting Card Assortments: Easter, Birthday, other occasions. Personal Stationery; Gift Wrappings. Big profits. Experience unnecessary. Samples on approval. Wallace Brown, 225 Fifth Ave., Dept. A-4, New York 10.

WE pay you \$25 for selling fifty \$1.00 assortments Birthday, All Occasion cards. Tremendous demand. Sell for \$1.00—your profit 50c. It costs nothing to try. Write for samples. Cheerful Card Co., 37 White Plains, N. Y.

SILVER Plating Liquid. Simply Rub-On with a cloth. Cleans, Silverplates, Polishes, one rubbing. Puts on genuine 1000 Fine silverplate. Renews silverplated ware like new. Silverplates onto brass, copper, bronze, etc. Lasting finish, won't come off. Sales representatives wanted. Details free. NuProcess Products, Dept. 203, Aurora, Ill.

BEAUTIFUL Gold Embossed Honor Scroll for Veterans. Most beautiful service memento anywhere, regardless of price. Sells on sight for \$1.00—Up to 85c profit to agents. Three saleable samples \$1.00 postpaid. Particulars Free! Levine's, Box 15-A, Boulevard Station, New York 59, N.Y.

200 MONEY Making Plans, Schemes, Formulas. Formico Co., Box 572, Dayton, Ohio.

WHOLESALE: Razor Blades, Laces, Excello, Texide, Silvertex and others. Write for prices and information. National Sales Company, Dept. 114, 1319 Stone Street, Flint 4, Mich.

\$3 FIRE Extinguisher sells wholesale or direct. Fire-Killer, Zone 1, Syracuse, New York.

BUILD Year Round Lifetime Business, sell everyday necessities to stores, institutions, industrial plants, homes, etc. Easy repeats. Excellent profits. Great cooperation. Become territory distributor. Investigate. Lytle Supply Co., Ave. 12, Fredericksburg, Ohio.

SCHOOL Seniors: Sell Classmates superb Craftcards for super profits. Write Craftcards, Box 235 (AH) Pittsburgh, Pa.

POPULAR SCIENCE OPPORTUNITIES

POWERFUL Mile Stretcher! Increases mileage! Increases power! Increases Bank-Accounts! Tremendous Profits! Thermopower. Peoria 4, Ill.

HOW you enjoy Double Profits selling Rug-kleen and Mothtex Concentrates to homes, hotels, rooming houses, etc. Send for New complete offer. Tremendous profits. Year round repeat business. Products used daily in every home. Russell-Johnson Co., Clarkfield, Minn.

Mr. MAGIC is back! Big profits packaging, distributing this amazing cleaner. Everything furnished. Sample 25c Linnell Co., Box 1720, Cleveland 5, Ohio.

25 WAYS to make money with Luminous Paint (Shines in dark). Rush only 25c for details and luminous sample. Address, Lite-Saver, 97B, Saybrook, Conn.

SELL through agents? Your ad in this column will reach capable, ambitious men who are interested in making more money. They may be interested in your proposition. Advertise it here and get business. Rate is only 50c a word. Write for details to O. K. Kelly, Classified Section, 353 Fourth Ave., N. Y. C.

3 AIR CONDITIONING

CONVERSION Gas Burners, Blowers. O. A. Moore Equipment Co., Lincoln 6, Nebr.

4 AMERICAN POLICE, JU JITSU

DEADLY Judo-Fiercest fighting technique. Complete course (200 photographs) special \$1.00. Variety House, Box 46-AB, Wall Station, N.Y.C.

5 ANTIQUES, RELICS, INDIAN GOODS

SWORDS, rapiers, daggers, pistols, armor; illustrated catalog, 25c. Robert Abels, 860½ Lexington Ave., N. Y.

10 FINE Indian Arrowheads, \$1.00. Catalog. Geo. Holder, Glenwood, Ark.

ARROWHEAD & lists 15c—Indian Relics & Curios. 312½ Pine, Green Bay, Wis.

440 ANTIQUE Firearms;—4,000 Bargains:—Coins, Indian Relics, Cartridges, Minerals, Rifles, Fossils, Flintlocks, Swords. Catalog with photograph 25c. Heike, Wenona, Ill.

20 ANCIENT Indian Arrowheads \$1.00. 4 tiny perfect bird arrowheads \$1.00. List Free. Lear's, Box 569, Galveston, Texas.

ANTIQUES firearms, swords, daggers, powder-horns. Lists free. Nagy, 8-M South 18th, Philadelphia 3, Pa.

REPRINTED Abraham Lincoln Liquor License only \$1.00 for two copies. Yes—Lincoln operated a Tavern in 1833. Proof and many interesting facts shown on this Antique Document. Send for it—Now. Charles Co., Preuss Station, Box 56, Los Angeles 35, Calif.

RR ARCH SUPPORTS

BIG Profits Manufacture custom arch supports. Julius Corssen, 2638 Geyer, St. Louis 4, Mo.

DD ASTROLOGY

FREE! 3 Questions Answered With Solar Horoscope. Send birthdate 25c. Professor Holliday, L-15114 Long, Columbus, Ohio.

6 AUTHORS SERVICE

NEW WRITERS needed to rewrite ideas in news-papers, magazines and books. Splendid opportunity to "break into" fascinating writing field. May bring you up to \$5.00 per hour spare time. Experience unnecessary. Write today for free details. No obligation. Postcard will do. Comfort Press, Inc., 210-R S. Seventh St., St. Louis, Mo.

I Want New Writers to cash hundreds of checks for \$1 to \$100, offered each month. The easiest way to write for pay. No previous experience necessary. Send for free details. No obligation. Saunders M. Cummings, Box 609-S, Colorado Springs, Colo.

IMMEDIATE Income for Writers, beginners or advanced. My plan reveals how. Sell short personalized stories, waiting market, prompt remittance. Profitable and pleasant. I'll prove it. S. Snyder, Box 4907-W, Philadelphia 19, Pa.

BIG Money writing "Information Folios". Instructions, samples \$1. Mackormack, (BB-3), Madeira, Ohio.

7 AUTOMOBILES

SEE our ad under motorcycles for midget car and motorscooter bargains. Midget Motors Directory, Athens, Ohio.

AUTOMOBILE Racing Book, Fifth Edition

—Revised. Tells how to build dirt track bodies, frames, engines. Records, super-chargers, rules, formula, plans, stock conversions, roadster racing, fast Fords. \$1.00 postpaid; \$1.15 C.O.D. Ray Kuns, Department 274, Madisonville, Cincinnati, Ohio.

CUSTOMIZE your automobile. Illustrated new restyling ideas, instructions, specific model changes by simple methods. \$1. Speedwheel, Box 723-C, Arcadia, California.

GARAGE doors, all types, controlled from Dashboard. Complete "Build Yourself" Plans \$1.00, refundable. Free Particulars. Kaytor Laboratories, Lynwood, California.

BUILD Midget Racer from castoff parts! Plans, specifications, construction information, \$1.00. Motor Supply, Box 1682-CS, Toledo, Ohio.

INTERESTING, Educational, illustrated English "Motor" magazine on foreign automobiles. 50c postpaid. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

NOW Ready! Floyd Clymer's Historical Motor Scrapbook Number Three, entirely different from Editions One and Two. Ads, photos, descriptions, specifications over 200 early autos, including Rolls-Royce, Owen Magnetic, Fordmobile, Revere, Ruxton, Cord, Roamer, Diana, Adler, Mercedes-Benz, Stutz Bearcat, Marmon, Stout, Flint, Lozier; steam and electric cars, many others. Motorcycle section includes early Cleveland, Henderson "6", Peerless, Wagner, Crocker, AMC, BMW, Excelsior, Ariel, Flanders, others. Pike's Peak races, many interesting incidents early automotive days described. Profusely illustrated. Continues Floyd Clymer's interesting autobiography. \$1.50 postpaid; De Luxe Cloth-bound, \$2.50. (Editions One and Two also available at these prices.) Clymer, 2125 W. Pico, Los Angeles 6, Calif.

STEAM CAR Scrapbook. Compiled by Floyd Clymer. Historical, authentic, amusing. Ads, photos, descriptions 250 early steam cars, with fascinating story by one-time world's youngest auto dealer. Postpaid \$2.00. DeLuxe Cloth-bound \$3.00. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

PHOTOGRAPHS. World's Finest Automobiles. List 10c. Box 1028, Minneapolis, Minn.

1946 IGNITION Supercharger \$5.50 Fast starting. Pep, Mileage, Eg Mfg. Co., 355b E. 149th St., New York.

JET impulsion now for automobiles. Rush name for free literature. Wayne Engineering, Greenville, Ohio.

END winter starting troubles. Simple, proven method. Auto-Kwik-Start instructions \$1.00, postpaid. Hallcock-Busse Co., Waseca, Minn.

8 AUTO SUPPLIES & EQUIPMENT

HAVING Car Trouble? New, Used, guaranteed auto, truck parts save money. Transmission specialists. Describe needs; immediate reply. Victory, 2930½ No. Western, Chicago 18.

NEW miracle motor fuel cuts driving and engine repair cost in half! Made by all major oil companies. Usually half price of gasoline! Will not form carbon, dilute oil. 1946 trucks coming equipped to utilize this fuel! Practically unknown, tremendous opportunities exist now! Hand book containing complete copyrighted information one dollar, or order C.O.D. Money back guarantee! Alberts, Box 492, Alhambra, Calif.

PLANS for vaporizing heavy fuels for burning in Auto, Marine, and Stationary Engines. \$1.00. Techno, 1902 Mariowe St., Bremerton, Washington, U.S.A.

WHIRLGAS Turbinator, \$3 carburetion improver, guarantees increased mileage and power by proven tests of universities. Auto make, year required. John Hanley, 5719 Loraine, Detroit 8, Mich.

STAY Clear keeps windshields free of Fog or Steam. Drive with windows closed in Rain or Snow. Send 25c. M. Pankwith, 278 Milesquare, Yonkers 2, N. Y.

ANTI-FREEZE. Noncorrosive, inexpensive, manufacture yourself. Details for stamp. Betke, Box 699, Borger, Texas.

MAKE your own grease removing soap, save ½ formula 50c. Basil Brooks, Edmore, Mich.

NUPLA Hammer Hard Hitting Softie 1½ Head size 2# Gas and oil proof no cutting—marring \$4.00. Nupla, 1017 N. Sycamore, Los Angeles, Calif.

R & R Mfg. Co. Auto and Marine Division, Anderson, Indiana. Robert M. Roof. \$1.00 for our 1946 Speed and Power Equipment Catalogue with price sheet. Showing Racing Cars, Midgets, Speed Boats and Supplies.

TIRES!

SEND us your Part "B" Tire Ration Certificate and tell us the size tire needed. We will send C.O.D. within 3 weeks OPA prices. A leading brand of tire. Rocket Associates Inc., Box 29, Glen Ellyn, Ill.

OIL Pumping Motors—Brought Back to Normal without Ring Job. Write for particulars. Joe Muliner, Box 3102, I, St. Paul, Minn.

BATTERY charger, eliminator kits, relays, rectifiers, surplus list dime. Milton Bursma, Rt. 5, Grand Rapids, Mich.

IF your auto supplies or equipment will help Popular Science readers protect their cars, they're interested in buying from you. Advertise your product in this column for real results! Rate is only 50c a word for over 689,903 circulation. Classified Section, Popular Science Monthly, 353 Fourth Ave., N. Y. C.

9 AUTO TRAILERS

BUILD your own Trailer! Save Money! Have every feature you want! Plans for House, Sport, Camp and Utility trailers. Catalog describing 9 models 10c. (15c in Canada and overseas) Jim Dandy, Box 125-B, Wausau, Wisconsin.

10 AVIATION

JET Propulsion Experiments. New principle to drive boats, bicycles, model helicopters. Circular on plans. Rush name. Houston Maupin, Tipp City 54, Ohio.

YOUR private, commercial or instructor license quickly and at less cost. Part cost may be earned while flying. Ideal flying conditions. Write for deal. Gottschalk Schools of Aeronautics, Adrian, Michigan.

SEND 25c for Directory of War-Bargain airplanes and gliders located all over the United States, some probably near you, with owner's price, name and address. (35c by first class mail) Used Aircraft Directory, Athens, Ohio.

PROPELLERS-Airliner 3 blade, fit any motor, ice, snow sleds, boats, defrosters, lists free, fast delivery. Aircool conversion diagrams 50c. Standard Aerocraft, Ft. Worth, Texas.

BUILD and fly your own motorcycle powered monoplane at home. Easy to build, short run takeoffs, sweet plane to fly. Tested plans, guaranteed, \$1.00. Order Today, Now. Aerotech, Dept. 60, Dearborn, Mich.

JET Propulsion. Know jet propulsion. Build your own units for model airplanes. Get complete data, drawings, design charts only 50c. Technical Press, Box 951V, Salem, Mass.

PORTERFIELD \$275, Waco \$125. New catalog, 25c, lists thousands of sensational bargains in airplanes, motors, parts, parachutes, supplies. Aviation "Business Opportunity" section included free! National, Box 1682-CS, Toledo, Ohio.

MORTON 5-cyl. radial model airplane engine, almost new, with prop, develops ½-HP., weighs 12 oz. \$55.00. R.C. Beard, Lancaster, Pa. P.O. Box 1115.

PILOTS, Mechanics—Complete, Illustrated Altimeter Handbook. Includes use, installation, servicing, setting, testing etc., 35c cash. Stenzel, 341 Tanner, Rantoul, Ill.

CUB \$550, Aeronca \$850. Prices often like these or less. Send 25c for listings of used aeroplanes, engines and equipment. "Sky-Pilot", P.O. Box 3197, Savannah, Georgia.

POPULAR SCIENCE OPPORTUNITIES

Q BABY CHICKS

CHICKS for broilers or layers. Pure breeds, Crossbreeds. Write for prices, folder. Amstutz Hatcheries, Box 300, Orrville, Ohio.

11 BATTERIES, GENERATORS, ETC.

150 AMPERE Generator for welding \$47.50. Extra flexible cable, 10 ft. lengths \$2.75. Other bargains. Butler Electric Company, 1885 Milwaukee, Chicago 47.

QUARTER Brings "Key to Control" of battery life, capacity, plus money making list. Battery Bureau, 2225 N. 49th St., Milwaukee 8, Wisc.

12 BLUE PRINTS & PLANS

TAILORED Homes—the modern plan book. Ad under Heading Miscellaneous.

13 BOATS, OUTBOARD MOTORS, ETC.

FULL size, cut to shape boat patterns, blueprints. 7½-38 feet. Illustrated "Build a Boat" catalog, 10c (coin). "How to Build Boats" book, \$1.00. Cleveland Boat Blueprint Co., Dept. A-77, Cleveland, Ohio.

MARINE Power—Easily convert any Ford motor (domestic and foreign) with Osco parts and kits. Complete catalog 25c (coin). Osco Motors Corp., 2020 E. Orleans St., Philadelphia, Pa.

14 BODY-BUILDING COURSES

BAR-BELLS. Dumbbells. Exercise equipment. Courses. Special offers! Free booklet. Good Barbell Co., Reading, Pa.

DEADLY Judo-fiercest fighting technique. Complete Course (200 Photographs) special \$1.00. Variety House, Box 46-AA, Wall Station, N. Y. C.

15 BOOKS, PERIODICALS

EDUCATIONAL Books sold cheaply or rented for small fee. Books bought. Money back guarantee. 4,000 Bargains. Catalog Free. (Courses Bought). Lee Mountain, Pisgah, Alabama.

"BOOKALOG" Free Books, Opportunities. Enclose stamp. Golden, 5698S1 Oak-grove, Oakland 9, California.

RARE Out-of-Print Books located. Bookfinders, 1210 N. 11th Ter., Birmingham, Ala.

ADULT Books. Sample and catalog 10c. Alstone, 310 Lunenburg, Mass.

BOOK Bargains. Illustrated catalogs free. Rialto, 349-A Sackett, Brooklyn, N. Y.

100,000 POST-WAR Jobs abroad—South America, China, India, Burma, Japan, Russia, Malaya. How and where to apply now. Post-war U. S. participation in world reconstruction and trade demands thousands of American-trained mechanics, salesmen, technicians, engineers, foremen, laborers and business representatives—every trade needed. Our 15,000-word copyrighted forecast—compiled from business, professional and government sources—lists over 200 big U. S. firms with foreign interests, gives job information, salary brackets, contract tips, application letters, passport information, climatic conditions, etc.—vital facts for your immediate application. \$1.00. Return for refund in 7 days if not satisfied. Pacific Industrial Research Bureau, 202-D Studio Building, Portland 5, Oregon.

FREE Booklet—The Truth About Jesus. John C. Meek—P.O. Box 512—Baltimore 3, Md.

MAGAZINES (back dated)—foreign, domestic, arts. Books, booklets, subscriptions, pin-ups, etc. Catalog 10c. (refunded). Cicerone's, 863 First Ave., New York 17, New York.

SEND 25c for Stereopix Navigation book. Addison-Wesley, Cambridge 42, Mass.

ANY book on Architecture, Art, Craft, supplied. Catalog, stamp. Arcraft, Box 6227, Baltimore 4, Md.

FDR in prophecy. Dime. "Pre-Dix-It" Monthly. Free copy. Nichols, Box 85, Waltham 54, Mass.

BIG Profits Taking Subscriptions For All magazines. Agents' Confidential Catalog listing over 2500 periodicals and complete starting supplies Free. Pines Subscription Agency, Flushing, N. Y.

BOOKS, (out-of-print, new, used) quickly supplied, many 35c bargains. Catalogue. Mid-West Book Service, 18870 Marx Ave., Detroit 3, Michigan.

BOOKS. Pictures. List Free. Sample Assortment \$1. Nu-Art, 436 N. Y. Ave., Brooklyn 25, N. Y.

MONEY and Hobbies. "Seven Cures for a Lean Purse" \$1.00 each. Helen White, Route 3, Middletown, New York.

BACK number magazines reasonable. Reedmor, 841 Intervale Ave., New York, N. Y.

RATIONAL View of Life—\$1.00 (Book) Benjamin Seibert, Urbana, Ohio.

FREE Catalog—New Books. Happiness Books, SA 41 Union Square, New York 3, N. Y.

TAILORED Homes—the modern plan book. Ad under Heading Miscellaneous.

FREE! Copy of "The Western Specialist" 12 Hayward Place, Boston 11, Mass.

BACK-Dated Magazines supplied quickly. Send Wants. List free. Arkell's, 1071 N. Western, Los Angeles 27, Calif.

"WHOLESALE Catalog", Directory 10c. Hundred's of Thousands Articles. Stafford, Sunnyside-S, Indianapolis 44, Ind.

ART of Drawing Women \$1. Art of Cartooning \$1. French Cartoons \$1. Others. Major Book, 7204S Juno, Forest Hills, N. Y.

GOOD "Used" self-instruction educational books on all subjects bought, sold, rented, exchanged. Satisfaction guaranteed. Complete information and 100-page illustrated bargain catalog Free! Write—Nelson Co., Chicago 5.

OZARK Magazine, Lonsdale, Arkansas. For homesearchers, sportsmen, folklorists. Year: \$1.00.

BUILD Your Own Fortune! The rules of fortune building are infallible and have been followed by successful men and women ever since the days of ancient Babylon. These rules were not taught to you in school, nor taught to you in college. Building a fortune is explained fully in the book "Seven Cures for Lean Purse". Send \$1.00 for a postpaid copy. W. L. Bedard, 3420 Montclair, Detroit 14, Mich.

HERBALISM—Complete Course in 2 volumes. 1000 recipes. Particulars free. Home Service, Forestville 3, Va.

TRADE Magazines. Business. Vocational. Diversion. Current single copies. Over 200 fields. Free price-list. Commercial Engraving Publishing Co., 348 N. Ritter, Indianapolis 1, Indiana.

JOIN new Technical Book Club—Free! Members receive current literature, guidance on all book problems, premiums. No obligation. All technical, scientific, home-craft books etc. Specify subject for free information. Modern Technical Book Co., Dept. MS, 55 W. 42nd St., New York 18.

MOVIE Stars Classic selection, for their beauty and charm of Hollywood's popular feminine film celebrity's. Genuine glossy photographs. 20 for \$1.00, size 3 1/4 x 5 1/4. Charles Scott, P.O. Box 342, Covington, Ky.

WHOLESALE Catalog. Directory 10c. Hundreds of thousands articles. Stafford, Sunnyside-X, Indianapolis 44, Ind.

AMAZE with supermemory! Facts, figures, names stick like burrs. Write B13, Thor Books, Box 1210, Chicago.

WHAT Every Mason wants. We have Masonic books for Blue Lodge, Chapter, Commandery Scottish Rite and Shrine. Our rituals are used the world over. Send for our free catalog of books and rituals for Masons, Odd Fellows, Knights of Columbus, etc. Ezra A. Cook, Publisher, Inc., P.O. Box 796-RD, Chicago 90, Ill.

UNUSUAL book offer by Varieties Meet varied needs. All topics of popular interest. Lists 15c. Varieties, 1472 Broadway, New York.

BOOKFINDERS! (Scarce, out-of-print, unusual books) Quickly supplied. Send wants. Clifton, Box 1377ps, Beverly Hills, Calif.

FREE Copy new scientific magazine. "Science Quest", Box 73F, Memphis 1, Tenn.

LARGE Illustrated 1946 catalogue of World's best books 10c. MayFair Sales, 305 W. 8th St., Los Angeles.

READ and Give Books. List Free. G. De Ruiter, 4 Hudson Drive, Wilmington, N. Carolina.

DICE—Read this scientific Folio to win consistently. \$1.00. Cormako, (BB2) Madeira, Ohio.

TECHNICAL Books largest list. Edwards, 324 N. 18th, Quincy, Ill.

PUBLISHERS! Here is a profitable market to sell your books! Popular Science readers buy all kinds of books. Ask us for proof and full facts. We'll show you how to get more business! O. K. Kelly, Manager, Popular Science Classified, 353 Fourth Ave., New York City.

16 BUILD IT YOURSELF

BUILD concrete block machine. Easy, inexpensive. Sell blocks, build home, garage, barn at low cost. Free Details. Horne, 208 W. Wilder, Tampa, Fla.

INEXPERIENCED? Build your home yourself. Your labor saves up to 60%. Valuable circular for beginners 25c. William Jackson, A.B., 1713 Howard, Port Huron, Michigan.

BUILD Tractors from Second hand automobiles. Convert horse drawn farm equipment into tractor hook-up. Tractor plans—\$1.50. Mowing Machine and plow hook-up plans \$1.00. Nolan's Garage, East Wareham, Mass.

BUILD your Own Whirl type power lawn & Weed mower with Rite-Way Blade Attachment. Free literature. 811W E. 31, Kansas City, Mo.

EXPERIMENTERS Work with Jet Propulsion. Circular on plans. Rush name. Al Waterman, Bridgeman, Mich.

TREMENDOUS demand for boats. Build in garage, basement. Profitable hobby. Send 25c for detailed drawings, instructions for racing sloop & list other designs, power & sail. Laboratory Press, Groton, Conn.

ELECTRO-Matic furnace for home or office. Convert now. Blue print and instructions how to build \$1.00. Electro-Matic, Box 734, Portland 7, Oregon.

TO get more business, advertise your "build-it-yourself" projects in this column. Popular Science Readers like to make and do things. They may be interested in your offers. Tell them your story for only 50c a word. Mail your ad to Classified Section, Popular Science, 353 Fourth Ave., New York City.

17 BUSINESS OPPORTUNITIES

\$100 PER week being made by many building and selling new simplified trailer. Plans complete \$1.98. Wayne Engineering, Greenville, Ohio.

COLORGLAZED Concrete Pottery made without molds. New, low cost, patented method. Cemetery products, novelties, tiles, floors, etc. Basement leaksealing. Other money-making projects. Booklet, details free. Men only. National Potteries, Fergus Falls, Minnesota.

GOOD Paying Business Silvering mirrors, plating autoparts, reflectors, bicycles, bathroom fixtures, etc., by late method. No tanks or shop required, outfit furnished. Free Booklet. Gunmetal Co., Ave. E, Decatur, Illinois.

START Home business making statuary, plaques, art goods, pottery, garden furniture, artificial marble flooring, liquid marble. Make flexible molds yourself. Amazing profits. Folder free. Creative Publishers, P.S.I., Winnetka, Ill.

\$25 WEEKLY working two hours daily. No canvassing. No Manufacturing. Lycke, Box 2471, Cleveland 12, Ohio.

HOW To make shell jewelry. Here is the only complete course of home instructions for making tropical jewelry. Gives complete instructions and beautiful photographs for making 33 different styles of sea shell and fish scale earrings, brooches, pins, sprays and hair ornaments. Includes dyeing, pearlizing, lacquering, golding and luminous methods. Also, wholesale prices for all materials required. \$1.00 per copy postpaid. House of Gifts, Box 4550-M1, Coral Gables, Florida.

SELL by Mail with Elco Ready Made Circular Service! Large Profits! Catalog Free! Elco, 434 N. Wells, Chicago 10.

POPULAR SCIENCE OPPORTUNITIES

IF you'd like to make \$5,000 annually or better, in an easily learned office business of your own, send for free details immediately. G. H. Cole, Pres., Syracuse 2, N. Y.

MOLD-MAKING. Plaster casting. Money-making Business. Literature Free. Kemlo, Park Ridge, Illinois.

10c BRINGS you baskets of mail. Catalogs, magazines, money making ideas, samples. Gardenville Publishers, Gardenville 10, N. Y.

MECHANICALLY Inclined Men—Own and operate general Appliance Repair shop. Complete, illustrated course shows you how. Welding, Refrigeration, Motor repair. How to get business, etc., all phases covered. Free literature. Christy Supply, Dept. 759, 2835 N. Central Ave., Chicago.

TYPEWRITER Repairing—Original Course—Simplified Home Study. Weber Type-writer Mechanics School, Box 269, Osborn, Ohio.

IDEAS for starting to choose your own Business, write to Dranichak & King, P.O. Box 310, Binghamton, N. Y.

THE new Master Champion Lawnmower Sharpener Machine is now available. Frank's Mfg. Co., Dept. 1, 3312 Tweedy Blvd., South Gate, Calif.

HUGE Profits, new Food Specialties! 5,000 word course \$2.00. Tirekop, Box P-12, Madeira, Ohio.

START Mailorder Bookshop—Everything furnished, publisher cooperation. 25c brings booklet, exclusive setup, samples, exciting ideas. General Publications, Ossining 1, New York.

DO You Want To Be Independent? "Opportunities to Share" will show you the way. Over 400 pages filled with down-to-earth facts on starting a business of your own on small capital. Limited Edition only \$5. or COD plus fees. Satisfaction guaranteed. Guid Company, 5902 Walnut, Kansas City 2, Mo.

SELL Books by mail. At home, spare time. Start small, grow big. Grand opportunity to establish clean, legitimate mail order business. "How" booklet 10c. Kraft Publications, 3114-S2 Walnut, Chicago 12, Ill.

MAIL Order Business course shows you how to make money, spare or fulltime. Teaches professional mail order technique—not penny-snatching schemes. Fascinating 100-page illustrated Success-Catalog Free! Write—Nelson Co., Dept. 4-01, Chicago 5.

START Furniture Refinishing Shop; Address P. Kepko, 500 Thornton Ave., Sharon, Pa.

"HOW To Make Simple Molds and Plaster Plaques." Profitable Business or Hobby! Instructive booklet 25c. Plastercraft, 1406 East 43rd St., Cleveland 3, Ohio.

YOU too can learn how to make, mold and cast Real Plastics. Send stamped envelope. Box 498, Gainesville, Texas.

SELL Cosmetics By Mail. Women spend millions on Beauty. You can make your share of this Cosmetic Money. Let us show you how. Details Free. Frank J. Artz, 1060 Harding Drive, Toledo 9, Ohio. Dept. B.

SELL By Mail. Particulars Free. Write Frank J. Artz, 1060S Harding Drive, Toledo 9, Ohio.

START big money business on few dollars. New, successful cleaning service. Big demand everywhere. Easy, quick income. Write Americlene, 211 N. Seventh, St. Louis, Missouri.

LIQUID rubber for making molds for plaster castings. Finest quality! Sample? Sure! Costs more, worth more \$3.00 quart \$10.00 gallon. W. Wooley, 115-A Donald, Peoria, Ill.

RECAST old batteries into new. Latest achievements. Battery Laboratories, Minn.

COLOR Concrete with Chemicals. Big money making Hollywood style pottery, birdbaths, without moulds. Wishing-wells, stucco-rock, benches. Marbling, cement water-paint. 10c brings sample, literature. Pictures. Hollywood Cementcraft, 8530 Wonderland, Hollywood 46, California.

\$4.97 PUTS You in business. Write. Midwest Drug Co., Dept. 5, Columbus 15, Ohio.

LEARN Profitable Credit-Collection Agency Business; Earn \$5,000-\$10,000 Upwards Annually; Excellent Sparetime Possibilities; Postcard Brings Interesting Literature Free; Write: Educational Extension Service, Dept. 102, Los Angeles 36.

UNPAINTED Wall Plaques 2¹/₂c up. Illustrated list free. Oman, 642 Broadway, St. Paul 1, Minn.

WE start you in business at home. Sparetime earning \$10-\$30 weekly, selling by mail. Stamp appreciated but not necessary. Driscoll Sales Service, Box 2771-G, Denver, Colo.

LIQUID Marble: snow-white, multi-colored. Glazed. Unglazed. Composition Flooring. Lifetime wear. Any color. No priorities. Flexible molds. Plaster casting. Get into the big money now. Full information given free. Write—Compo-Tex, Box 786-F, St. Louis, Mo.

FELLOW Workers—Down with Bosses—Start own business—Be Independent—Booklet describing 127 Tested Plans, free. P. Padney, 307 York St., Jersey City, N. J.

A D V E R T I S E R S !

Increase Your Mail Order Business!

Good advertising values are in keeping with the times.

Popular Science Monthly's CLASSIFIED SECTION now offers the biggest value in its history. Year after year our circulation has steadily increased. Today it is the largest it has ever been! The latest A. B. C. report shows an average monthly circulation of

689,903

This is a substantial increase in the number of prospects for classified advertisers—and at no increase in advertising cost. Our classified rate is still only 50c a word.

Take advantage of this extra advertising value by offering your product or service to this great audience of Popular Science readers. Prepare your advertisement now! Count the number of words and remit at the rate of only 50c a word. Act promptly to be sure of your advertisement in the next issue.

Classified Section

POPULAR SCIENCE MONTHLY

353 Fourth Ave., New York City

ELECTRICAL Appliance Repair. Open your own shop. Learn house wiring; electric motors, vacuum cleaners, washers, etc. Complete illustrated course shows how. Free booklet. Pacific Training School, Dept. AS-1, 4703 W. Pico, Los Angeles 6, Calif.

START home business making and selling miracle All-purpose Spot Remover. Big demand every home amazing profits. Full particulars and Formula \$1.00. H. Smitjah, 4400 S. Wabash, Chicago, Ill.

BOOKKEEPERS — Operate Your Own "Dollar-A-Week" Bookkeeping & Tax Service. Full or spare time. Details free. Ellis, Box 203, Cedar Grove, N. C.

HEALTH First! New Drugless Method. Dynamic techniques; quickly learned. Results Unbelievable. Big earnings operating a "Health Conditioning Club". Metabolic, B9128-C, Sta. S., Los Angeles.

HEDDEN Metal-Detectors. Materials now available! We have the latest in circuit and mechanical design plus The Know How! Write for literature. Heden Metal Detectors, Box 6892, N.S. Pittsburgh, Pa.

START Home Business making Novelties, Plaques, Souvenirs. Colorful Liquid Marble. Make your own Flexible Molds. Write for Free Information. Bing Products, 621-BB Tremont St., Boston 18, Mass.

INFORMATION—Locating Articles, Products (Wholesale) etc. Rakes, Box O-5931, Chicago 80.

MAKE and Mold genuine Plastics. Forty illustrated work-sheets explain methods, processes. Authentic, simplified. \$1. Free circular. Plastics Digest, 3937D Tracy, Kansas City 4, Mo.

MAKE Your Fortune in great new industry manufacturing and marketing products containing "DDT". Wonder-Working Insecticide. World-wide waiting market. My Ten Master DDT Formulas and simplified manufacturing and marketing instructions for starting on small capital. Rush request for full details, free. Howard Robinson, Ph.G., 1322 S. Ohio, Sedalia 10, Mo.

\$24,500 RICHER: Used 'Schemes' from "Schemer" Magazine. Alliance, Ohio. 48th year. \$1.00. 4 samples, 30c.

START Advertising and Letter Shop. Complete low cost home training shows how. Free booklet. Pacific School, 1-C, 7217 S. Broadway, Los Angeles 3, California.

WANT to make \$100 weekly? No Poolin! Details and Valuable tested Business Secrets, Success Plans, Moneymaking Information, 25c postpaid. Refund coupon. Rush Wilkin, 118¹/₂-P E. Main, Hillsboro, Ohio.

CAN The Boss! Make strange new plastic for 1c pound. Makes beautiful, durable floors, walls, roofs. Bays Laboratory, Oklahoma City 9.

WANT to sell by mail? If it's information you desire, get the facts, avoid needless risks. Absolute necessity if planning to sell by mail. Write. Elco Service, 3338 Monterey, Detroit 6, Mich.

TRADE Magazines — Classified Directory 3343 Business, Vocational and Diversion publications with addresses and subscription rates. \$1.00 postpaid. Commercial Engraving Publishing Co., 34SS N. Ritter, Indianapolis 1, Indiana.

MONEY-Making Opportunities—Free literature. Readers' Service, 640 Peoples Bldg., Charleston, S.C.

RUBBER Mold Making Liquid make gifts, novelties. Pre-war quality. Free Cast-wood Plastic Model with sample quart \$2.95, directions. Rubbercoat, 3873 California, San Diego, Calif.

SELL by Mail, Health Products information. Big Profits. Small Capital. Write Burke, 1345-Robson, Vancouver, Canada.

"HOW To Raise Poultry For Profit"—Free illustrated book fully describes home study courses which have successfully, quickly established hundreds into their own profitable business. Highly recommended. Write today. No obligation. National Poultry Institute, Dept. S1, Adams Center, New York.

RUBBER Moulds for casting novelties. Latex for making Moulds. Use thoroughly tested and approved products. Eastern Latex Laboratories, Box 153, Mattapan 26, Mass.

SERVICE Men—for branch managers. Amidon Engineering Co., Elyria, Ohio.

HEY School Seniors! Want Spending Money? Then rush postal for simple instructions. Craftcards, Box 235 (AD), Pittsburgh 30, Pa.

SIX Leading Mail Order Publications 25c. Full of articles, plans, schemes. Wholesale Offers. Kraft, 3114-S2 Walnut, Chicago 12, Ill.

MIMEOGRAPHING, big mail. Moneymaking, 25c. Duggan, 1237-PSM Voskamp, Pittsburgh 12, Pa.

ATTENTION Manufacturers - Invention, compartment dish, eliminates old method of coloring Easter eggs in cups. Pat. Pending. Write Box 679, 113 W. 42 St., N. Y.

START a clock shop while clock repairing is booming. Our easy to learn home study course with pictures and illustrations teaches you how to repair all kinds of clocks. Information free. Houston Clock Shop, P.O. Box 5086B, Houston 12, Texas.

START profitable home mail order business. \$5.00 required. Details free. Powell Service, 5713 Euclid, Cleveland 3, Ohio.

POPULAR SCIENCE OPPORTUNITIES

THOUSANDS of Alarm Clocks need repairing. Jewelry stores swamped. Our simplified course with pictures and drawings teaches you how to repair those clocks. Necessary tools and supplies furnished with course. Alarm Clock Repair Service, P.O. Box 1983B, Houston 1, Texas.

QUICK Money! "Repairing Car Batteries." At home. Easy too. Write, Batteryman, 901 South Avenue, Grand Junction 1, Colorado.

MAKE and Mold genuine Plastics. Forty illustrated work-sheets explain methods, processes. Authentic, simplified. \$1. Free circular. Plastics Digest, 3937D Tracy, Kansas City 4, Mo.

JUMBO Hershey Deal on 2½c Board—Leave us Face it. Candy is Scarce. Hersheys are Scarcity—if Sales Board are allowed in your territory Write Jay J. Wico & Co., Loganspot, Ind.

EXPORT, Import, represent manufacturers. Deal with South America, Africa, China, Europe. War—peace time big business. Uncrowded fields. Unlimited opportunities. Deposit one dollar for two bulletins. Money refunded if unsatisfied. S. Benko, 246 Fifth Ave., New York.

BE Independent! Become associated with us in an essential proven profitable profession. Universal Exterminators, 956 Margate Terrace, Chicago 40, Ill.

OPPORTUNITY for Home Workers to build steady income. No Special Skill or Equipment needed. Industrial Development Service, 3006 Ridge Ave., Philadelphia 21, Pa.

BUILD for prosperity. Free catalogue. Baker, 5509 Winthrop, Chicago 40.

MEN, Women, Veterans, Boys. Make up to \$25 a day. Free Literature. N. Hogan, 901 N. 15th St., Philadelphia 30, Pa.

START Own business at home. Be our agent your community for leading magazines. Supplies details free. American Readers' Service, Guynedd, Pa.

BENEFIT Mankind and yourself in a new Semi-professional home run business. The World's our territory, limited trainees per area. You must be free of criminal record. The Smith System, 217 W. Kiefe, Milwaukee 12, Wisconsin. Dept. 4.

YOUR Own Business—As little as \$100 starts you Now! No training needed! See our ad on page 256. American Photocopy Equipment Co., 2849 N. Clark St., Dept. HU16, Chicago, Ill.

OWN A Going Business—Three big issues reputable national magazine packed with money-making merchandise and equipment offers. Rush 25c. 1107-D, Times Star Tower, Cincinnati 2, Ohio.

METALLIZE Baby Shoes! Learn This Easy. Money Making Business From Nationally Recognized Consultant. Small Investment: Free Details. Joseph B. Kushner, B.S. Ch. E., Metal Finishing Consultant, R.D. 3, Stroudsburg, Penna.

BUILD Own Business Mailing penny post cards; six profitable plans with information for starting. Gordon Publishers, Box 23, Pawtucket, R. I.

SPARE Time Mail Business Earned \$1400 Monthly. Copyrighted Instructions. \$1.00. Will Boyd, 331 Fourth, Pittsburgh 22, Pa.

BUILD Miracle Homes. Yours. Others. Chamberlain, Fitzsimons Building, Pittsburgh 22, Pa.

MOLD perfectly lettered monuments. Cost fifty cents, bring \$12.50. Details free. 106 Richland Gardens, Martin, Tenn.

BE a stockholder guaranteed 15% and cost nothing. Investigate, Leffell Devices Inc., 811 N. Charles St., Baltimore, Md.

MEN—Women—"Everybody Likes Candy". Learn to manufacture professionally at home. (Our 35th Year). Ragsdale Candies, East Orange, N. J.

FOREIGN And Domestic Jobs, all kinds. Latest accurate information on jobs, firms and projects in U. S. and Foreign countries. Mail \$2.00 to Industrial Research, Ltd., 403 Broadway Bldg., San Diego 1, Calif., for the 1946 edition of the Foreign Employment Digest. Lists the actual projects with application blanks. Cost more, worth more. 7 day refund privilege.

"10,000 ALASKA Fishing Jobs." Alaska's largest industry regularly employs thousands of men and women in seafoods production. Possible earnings up to \$5,000 in few weeks. Authentic 7,000-word copyrighted report gives job information, union requirements, sample application letter, names and addresses over 40 Alaska fisheries. Newest edition includes similar information on California, Oregon and Washington fisheries. Vital facts for immediate application in a permanent industry. \$1.00. 7-day refund privilege. Pacific Industrial Research Bureau, Dept. PS-9, 202 Studio Bldg., Portland 5, Oregon.

HANDY Men—Earn money home operating Community "Fix-It" Shop. Write, Stafford, 708 Rawlings, Carbondale, Ill.

RUBBER-Airlastex mold making liquid: Improved pre-war quality. Pint with instructions \$1.50. Gallon \$9.00. 20th Century Products, 3151-7, Southport, Chicago.

START own Business—Home, office. Sell by mail. Booklet Describing "127 Tested" Plans free. Vision Service, Box 2654 Gravois Station, St. Louis 16, Mo.

RAPID MARBLEIZING Liquid—Colorful, glazed! Molded, brushed, sprayed! Composition Floors. Rubberlastic Molds. Particulars free. Marbleizing Service, Edwardsville, Ill.

PLASTIC-Intermix, makes ordinary casting plaster shatterproof. Pint develops 100 pounds \$1.25 postpaid. Plastic Material Supply, 1416-N4, Fletcher, Chicago.

PLASTIC HOMES—Build yourself! Resurface old buildings! Wonderful building material. Marbleized Service, Edwardsville, Ill.

MAKE \$10. to \$20. or more a day selling History World War II Books, Bibles, Dictionaries. J. Henry Schilke, B127 E. Third, Cincinnati 2, Ohio.

HOMEWORKERS — Attention Veterans. Castwood plastic gifts, novelties. Materials, instructions furnished. Sample quart with mold \$2.00 postpaid. 20th Century Products, 3151-7, Southport, Chicago.

ANY Topflight Movie Star's "private home" address 50c; 131 Star's addresses \$2.00; Business list 2,232 addresses \$25.00. (Hollywood souvenir 25c). Star "personal" Movie Glide, 5922 Hollywood Boulevard, Hollywood 28, Cal.

MAILORDER independence without cut-throat competition. Thousands richer. More profitable work. Results or refund. Airmail dollar: Zigzag Corporation, Box 101-X, Guatemala, Central-America.

RUBBER-Liquid lastex "The Real Thing" Makes molds overnight. Sample quart with directions \$2.95, gallon \$9.50. Plastic Material Supply, 1416-N4, Fletcher, Chicago.

POSTWAR Security! The Greatest legitimate scheme ever devised to secure a big mailing list and a stream of dimes: Free particulars. Jack Killion, 7922 S. Vermont Ave., Los Angeles 44, Calif.

WORK for yourself. Your own business. Operate entirely by mail—direct from your home in spare time. Few dollars starts you. Literature free. Albert Wilcox, PS22 Nicholls, Georgia.

MAKE nameplates House-Numbers, Electric Signs, Box 221, Newport News 4, Va.

LATEX for making flexible rubber moulds. Thoroughly tested. No shrinkage. Complete instructions with each order. Stoneham Rubber Co., Box 244, Stoneham 80, Mass.

BABY Shoes Preserved. Complete Instructions. Exclusive Rights. M. E. Watson, Bellefontaine, Ohio.

HOW to finance any Business. Obtain Capital Research, Aitkin 2, Minn.

BOOKKEEPERS: General ledger and tax report experience. Operate permanent, profitable accounting service for the smaller business. Part or full time. Simplified method. Write now! L. A. Bell, 1402 W. 25th Street, Cleveland 13, Ohio.

WILDLIFE publications free. Fifty titles and sources, dime. Kass, Room 622A, 1328 Chestnut, Philadelphia 7.

SELL liquid Silvex for silvering and polishing write Belma products, 15 Grape St., Dept. B, Rochester 6, N. Y.

HIGH School Seniors: Make good money selling our Graduation Name Cards. Biggest commissions! Season starting Hurry! Craftcards, Box 235 (AM), Pittsburgh, Pa.

JUST Released: Liquid rubber to make molds for plaques and statues, plastic formulas and compounds. Apex Plastic Products, 1740 Estes Ave., Chicago.

HOW To Operate Your Own Advertising Agency Profitably, brand new copyrighted manual reveals all. Learn how you can start from home, spare time with few dollars capital. No stock or equipment to buy. Earnings unlimited. Sincere folks get free details. S. Snyder, Box 4907-A, Philadelphia 19, Pa.

AMAZE others. Add columns instantly. Add faster than adding machine. Free details. Maths Institute, Box 633, Mobile 4, Ala.

PLASTICS. Make your own at home. Formula and moulding instructions \$1.00. Box 84, Station K, Toronto, Canada.

WAR'S End makes sensational products available. Manufacture in basement or garage. Start on shoestring—Complete instructions \$1.00. Emac, Box 1947, Los Angeles 53.

OWN A mailorder paper products business. Sell envelopes, tags, labels, boxes, by mail, wholesale. Tremendous demand. Steady profits. No capital necessary. Write Omaha Envelope Service, Dept. 123, 4721 California, Omaha 3, Nebraska.

OPPORTUNITIES — Foreign Countries. Thousands of job opportunities in many fields. Information explaining where and how to apply. List of hundreds of firms with foreign interests \$1.00. Industrial Trade Surveys, Dept. A-10, P.O. Box 4151, Los Angeles 24, Calif.

BE your own boss. Start at home. Amazing profits. Literature free. Ace Sales, 920B1 Cullom Ave., Chicago 13, Ill.

18 BUSINESS SERVICE

NEW YORK CITY Address. Personal, Business Mail. Complete, Confidential \$2.00 Monthly. Chad-Ohr, 787 Second Ave.

GREAT Fun. Visit N.Y., Chicago, Hollywood, Montreal, by Mail. Evidence 25c. Souvenir 50c. Photo-Fun-Assortment \$1.00. Mailaddress Service. Details Free. Haller, 436 N.Y. Ave., Brooklyn 25, N.Y.

POSTCARDS. Letters sent from Canada in your own handwriting 25c, 50c. Write to C. Marr, 21 E. Pender, Vancouver, B. C.

435 ANTIQUE Firearms—4,000 Bargains: —Coins, Cartridges, Relics, Minerals, Rifles, Swords, Flintlocks, Fossils, Catalog with Photographs 25c. Heidke, Wenona, Ill.

19 CAMERAS, PHOTO SUPPLIES

BASS Says: War time proves Bass leadership. Amazing selection of finest still cameras—Leica, Contax, Korelle, Reflex, Argus, new and used still available. Write for quotations. Satisfaction guaranteed or your money refunded. Bass buys 'em, sells 'em, trades 'em. 35c Postpaid for 100 page book "Military & News Photography" by Jack Price. Up to the minute information. Bass Camera Co., Dept. SP, 179 W. Madison St., Chicago, Ill.

CASH! Spot cash for cameras, lenses, binoculars, movie or still, sound projectors. Send full description by mail, or wire for prompt cash offer. Over 30 years of dependability insures honorable dealings. 35c Postpaid for 100 page book "Military & News Photography" by Jack Price. Up to the minute information. Bass Camera Co., 179 W. Madison St., Chicago, Ill.

HAVE You a camera. Improve your hobby of photography and learn how to make better pictures. Write today for our latest book catalog and sample copy of American Photography, containing articles and pictures by the world's foremost writers and photographers. Camera House, 603, 353 Newbury St., Boston 15, Mass.

PHOTOGRAPHY for pleasure or profit. Learn at home. Practical basic training. Long established school. Write for booklet. American School of Photography, 1315 Michigan, Dept. 1742, Chicago 5.

CREATE Distinctive Pictures. Learn Picture Design. Study Portfolio 25 cents. Guaranteed. Guild, 1903 University Center, Cleveland 6, Ohio.

POPULAR SCIENCE OPPORTUNITIES

USED Camera Directory, Box 1031-K, Canton, Ohio—lists hundreds of War-Bar-gain Used Cameras—35mm, Speed Graphics, Kodaks, Rolleiflex—many others. Send 25c for latest issue.

FILMS, Standard Brand—127, each 25c. 120, 620, each 30c. 116, 616, each 35c. Add 10c per order for postage. Limit dozen rolls. Ask our lowest prices on other films, equipment, darkroom supplies. Free literature. Photo-Craft, 470-B Jamaica, New York.

MAKE Copy-All. Photostamp Printer. Instructions \$1 each. Tirekope, (BB-1) Madeira, Ohio.

ENLARGERS—Build your own. Kit of parts \$6.00. Free particulars. Crescent Engineering, Box 251-C, South Pasadena, California.

AVAILABLE Film flash bulbs equipment. Photo King Supply Shop, 6803 N. Clark St., Chicago, Ill.

21 CARNIVAL OUTFITS

YOU Make Them. Then make money like we have since 1906. Illustrated Plans 25c. "MooreMade", Lapeer, Michigan.

22 CARTOONING, SIGN PAINTING

"HOW To Make Money With Simple Cartoons"—A book everyone who likes to draw should have. It is free; no obligation. Simply address, Cartoonists' Exchange, Dept. 1441-C, Pleasant Hill, Ohio.

WHAT are your chances in Commercial Art? Send \$1.00, questions and sample of your work for helpful criticism and advice. Commercial Studio, Box 380, Sea Breeze, N. Y.

CARTOONING is fun. No previous experience is necessary. Many people now earn a living from this hobby. \$1.50. Send Money order, or we'll ship C.O.D. plus postage. Howard Co., Dept. PS, 141-45 71 Ave., Flushing, N. Y.

LEARN shorthand writing at home in spare time. Fascinating, lifetime business of your own. No special skill needed. Free information. Sherwood Publishing Co., Box 8, Dept. 65, Irvington, N. J.

CARTOONIST'S Magazine, Lessons, Plans, Markets! 25c. Coin, Hartman Studios, 2438 W. St., Lincoln 3, Nebr.

CARTOON Courses—22 Easy Lessons. 200 figure sketches. 25c coin postpaid. Snack-Pack Co., 32 E. Georgia, Indianapolis 4.

ARTISTS, students, sign painters. Newest books, courses, supplies. Big illustrated lists free. Art Book Shop, Kimmswick 1, Mo.

CARTOON Drawn. Your idea. 7x9 inches. \$2.00. Verret, Raceland, La.

23 CHALK TALK STUNTS

CHALK Talks. Laugh Producing Program \$1.00. Illustrated Catalog 10c. Cartoonist Balda, Oshkosh, Wisconsin.

LEARN chalk talk. Can make an interesting speaker of anyone. Command attention. Details free. Arthur Ryde, P.O. Box 1071, Springfield, Mass.

25 CHEMICALS & APPARATUS

LABORATORY Supplies at Wholesale Prices: Chemistry, Biology, Physics. Catalogue, 10c. National Scientific Co., 2204 W. North Ave., Chicago. Established 1908.

SPECTROSCOPE for quick chemical analysis \$2.50. T. A. Cutting, Campbell 3, Cal.

CHEMISTS. Chemical questions answered 50c. Formulas, analyses, minerals. Lewinsky, 26 Erwin Place, New Britain, Conn.

NEW 36 Page chemical apparatus order book. Complete line of chemical glassware, apparatus and chemicals. Send 10c for this book. Standard Science Supply Co., 1232 N. Paulina St., Chicago.

WINN'S New Idea Champion Chemical Kits, Apparatus-Outfits and Supplies for Students Home Experimenting. (Established 1931). Send 10c for catalog. John H. Winn, 124 W. 23rd St., Dept. 612, New York, N. Y.

LUMINOUS Paints will glow in dark. Six colors. Fairmount Chemical Co., 136 Liberty St., New York City 6.

CHEMICALS, Equipment, Books, Etc. Special Offers Free. Hallmark Technical Supply Co., Jamestown, New York.

CHEMICALS and apparatus for industrial, analytical, and private laboratories. Complete supply service for correspondence school students. Send 3c for catalog. Dept. M-26, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 7, N. Y.

HANDBOOK for Chemical Experimenters. Hundreds of experiments; illustrated. 50c. Experiment Booklet, 15c. 1946 Chemical Catalog, 5c. Reading Scientific Co., Reading, Pa.

CHEMICALS, ounce quantities, apparatus, catalog 5c. Fleischer's Laboratories, Everett 49, Mass.

CHEMAGIC Set: 50c 36 Magical Stunts. Chemlab Products, Box 306, Harvey, Ill.

50 "POISON" Gummed labels, 10c. D-Garda, 264 Ninth, Paterson 4, N. J.

100 DIFFERENT Chemicals. Ounce quantities. Excellent opportunity for diversified laboratory stock. \$6.90. Midwest Chemical Co., 3724 Second Ave., Minneapolis 8, Minn.

FREE Catalog: Chemistry, mineralogy, Biology, optics. Tracey Laboratories, Evanston, Illinois.

CHEMICAL Experimenters Supply Catalog 5c. Colonial Chemical Company, Brockton 28, Mass.

BREAKING up your laboratory? I buy used apparatus & chemicals. Joseph De Luca, 1530-68 St., Brooklyn, N. Y.

SEMI-TECHNICAL Chemistry Brochures. Literature Free. Lankton, 310-D Westmoreland, Lansing 15, Mich.

INTRODUCTORY Chemistry — complete textbook for beginners. 687 pages, contains 177 experiments for selfstudy. Formerly \$3.80 now \$2.00. Fairview, 277 Broadway, N. Y.

FREE chemical catalogue. Enclose 3c postage. Greenwood, 398 Broadway, N. Y.

CHEMISTRY is a favorite interest of many of the 629,903 readers of this magazine. This column offers an economical way to reach them with your advertising. Our readers will buy your products. Write today for full details. Classified Section, Popular Science, 353 Fourth Ave., New York City.

26 COIN COLLECTING

FREE! Foreign coin, banknote and Coin Collectors' Illustrated Catalog to approval service applicants. Send 3c postage. Tatham Coinco., Springfield-D50, Mass.

WILL Pay \$10.00 Each For Certain Lincoln Pennies! Indianheads \$50.00; Dimes \$1,000.00. Catalogue 10c. Federal Coin Exchange, 1-PS, Columbus, Ohio.

WORLD Coins, Large. Itemized, Descriptive List, 10c. Harry Elsholz, Box 9014B, Pittsburgh 24, Pa.

COMMEMORATIVE \$1/2-Columbus, Texas, Cleveland, Stone Mountain, \$1.50 ea. Illustrated Catalogue 25c. Norman Shultz, Salt Lake 9, Utah.

440 ANTIQUE Firearms—4,000 Bargains:—Coins, Indian Relics, Cartridges, Minerals, Rifles, Fossils, Flintlocks, Swords. Catalog with photograph 25c. Heike, Wenona, Ill.

\$2.00 TO \$100.00 Each paid for Hundreds of Old or Odd Coins. Keep all until posted. In business 40 years. Send 10 Cents for Illustrated Coin Value Book, and Bargain Circulars. Indian-Head and Lincoln Cents Wanted. Coin Exchange, Box 2, Le Roy, N. Y.

TWENTY Different selected coins \$1.00. Oddehon, Box 482, St. Louis, Mo.

THREE Foreign Bills Two Foreign Coins. Price List all for Twenty cents. Ralph Hirschberg, 23 Waverly, Oceanside, New York.

50,000 COINS. Invasion bills. Lists free. Nagy, 6-Z South 18th, Philadelphia 3, Penna.

43 MIXED Indian cents \$1.00—20 Foreign coins from 15 different countries \$1.00—50 different Foreign from 50 different countries \$5.00—Lists-Approvals. Delmonte, 40 West 18, N. Y. 1.

WE purchase Indianhead pennies. Complete coin catalogue 10c. Fairview, 277 Broadway, New York.

D CONSULTING ENGINEERS

M. M. GLASSER, B.E., Consulting Inventor. Twenty Years Experience At Electrical Mechanical and Military Inventions. Clients All Over the World. A few outstanding achievements are: Glasser Sweep Roto Fan, Glasser Remote Control Machine Gun, Glasser 300 Mile Siege Gun. 42 Laurens St., Charleston, S. C.

28 CURIOS

PISTOL Flashlight—Beautiful, plastic flashlight makes novel gift. Shipped postpaid \$1.00. Myers Chemical Co., 2134 Flatbush Ave., Brooklyn 10, N. Y.

435 ANTIQUE Firearms—4,000 Bargains:—Coins, Relics, Cartridges, Minerals, Rifles, Fossils, Flintlocks, Swords. Catalog with Photographs 25c. Heike, Wenona, Ill.

29 DETECTIVES

DETECTIVES—Work home—Travel. Experience unnecessary. Write. Wagoner P-125 West 86th, N. Y., N. Y.

DETECTIVE Training, Phillips Secret Service, 1917-C North Kenneth, Chicago 39, Illinois.

30 DOGS, BIRDS, PETS, RABBITS

A LIVING with Rabbits and Cavies. Markets Waiting. Magazine 10c. Book describing twenty breeds and magazine 25c. Book and magazine (monthly) one year 50c. Address Small Stock, Dept. 5, Pearl River, N. Y.

RAISE Giant Chinchilla Rabbits. Valuable Fur. Delicious Meat. Easily Raised. Pleasant Pastime. Large Profit. Free Booklet shows amazing profits from small investment. Willow Farm, R16C, Sellersville, Penna.

RAISE Guinea Pigs. Make money at home. Big demand. Booklet free. Taylors Cavy Farm, Hapeville, Georgia.

RAISE Moneymaking Angora Rabbits. Wool \$15.00 pound. Plenty markets. Particulars free. White's Rabbitry, Lawrence, Kansas.

ST. BERNARD Pups: Champion sired beauties. Franklin Young, R. 3, Riverhead, Long Island, New York.

STANDARD Rabbit Journal, Milton, Pa. 3 years \$1.00. Sample dime.

30 BREEDS—Pigeons, Bantams, Pigs. Catalogue 10c. Houck's, Tiffin, Ohio.

ANGORA Chinchilla, New Zealand Rabbits—Valuable Wool, Fur! Literature free. Book, "Backyard Goldmine" tells everything. \$1.00. Self-cleaning, scientific hatch plans, specifications \$1.00. Automatic Feeder plans \$1.00. All three \$2.50. Grinsteads, Dept. 16C, Edwardsville, Ill.

RABBIT Skins wanted. Prices, Shipping tags Instructions. Rabbit Products of America, 1113-A Walnut, San Gabriel, Calif.

MAKE your living plucking Angora rabbits. House of Angora, Springfield, Ill.

KK DRAFTING INSTRUMENTS

SAVE on drafting materials. Free catalog. Draftsmen's Supply Co., 32 North Wells, Chicago 6

31 EDUCATION & INSTRUCTION

DOES \$5000 yearly from your own Collection—Credit Bureau business sound good to you? We've shown others how. Why not you? Write: Cole & Associates, Syracuse, N. Y.

CLINICAL Laboratory Technicians in great demand. We train you in your spare time, in your own home. You can practice while studying. Write for free catalogue. Imperial Technical Institute, Box 973-B, Austin 5, Texas.

LEARN Powerful mental telepathy. Free literature. Elgin, 912 Benton, Nashville 4, Tenn.

STOP Stammering Complete Instructions \$1.00. J. Allen, Box 114, Saskatoon, Sask., Canada.

POPULAR SCIENCE OPPORTUNITIES

USED Correspondence Courses, Educational and Technical Books Bought, Sold, Rented. Catalog Free. Educational Exchange, Henagar, Ala.

PSYCHOLOGY teaches about mind. Biology teaches about body. Bio-Psychology teaches about powers of mind over body. Use powers subconscious mind. Select proper vocation. Grow. Broaden education. Develop personality. Control emotions. Succeed. Correspondence. Dept. P. Taylor School of Bio-Psychology, Chattanooga 1 Tennessee.

WRITE Short stories at home for pleasure and profit. Fame, riches and happiness of achievement are rewards to be realized by students who acquire tested technique. Get free booklet from home study school with 50 years experience. Write today! Blackstone-Sprague, Dept. 41, 307 North Michigan, Chicago 1.

GOOD "Used" self-instruction educational books on all subjects bought, sold, rented, exchanged. Satisfaction guaranteed. Complete information and 100-page illustrated bargain catalog Free! Write—Nelson Co., Chicago 5.

WHY Don't You Write? Writing short stories, articles, etc., will enable you to earn extra money. In your spare time we teach you to write the way newspaper men learn—by writing. Free "Writing Aptitude Test" tells whether you possess the fundamental qualities essential to successful writing. Write today! Newspaper Institute of America, Suite 566-A, One Park Ave., New York 16, N. Y.

GOOD Jobs and a Sound, Substantial Future await you in hotel and institutional field. Men and women—all ages—needed for well-paid positions that offer color, excitement, ever-new and fascinating duties. Record-breaking travel means even greater opportunities for trained men and women in hotels, clubs and institutions. Lewis School receiving calls for managers, assistant managers, stewards, hostesses, purchasing agents and 55 other types of important positions! From coast to coast there are important positions that offer splendid opportunities for advancement in a business where you are not dropped because you are over 40. Previous experience proved unnecessary! No need to leave your job to qualify. A good grade school education, plus Lewis Training qualifies you at home, in spare time. Our National Placement Bureau helps to place you—and our amazing Certified Job Plan—actually guarantees you will "make good" when placed. Write today for free book! This course is available under government auspices to discharged veterans, if qualified under the G.I. Bill. Lewis Hotel Training School, Room HA-2768, Washington 7, D. C. (First and only School of its kind—now in its 30th year.)

ADVANCED Piano Course. In one book. \$1.50. W. Otto, 4215 Park Ave., Union City, N. J. Sample lesson 10c.

GOOD "Used" self-instruction educational books on all subjects bought, sold, rented, exchanged. Satisfaction guaranteed. Complete information and 100-page illustrated bargain catalog Free! Write—Nelson Co., Chicago 5.

LEARN Fascinating Credit-Collection Agency Business; Office; Home; Spare-time; Earn \$5,000-\$10,000 Upwards Annually; Investigate Educational Extension Service Advertisement Under Business Opportunities.

ZIPPERS, How To Fix Them Yourself. Don't discard clothing, leather goods, etc. Easy instructions, sketches. Mail \$1.00 now. Morehelp, CB 16, Box 140, Lakewood, N. J.

WELDING—Electric arc. Learn quickly by actual practice at Hobart Welding School. Individual instruction at bare cost of materials. Seventy five cents in stamps brings valuable welding lessons post paid and full particulars. Hobart Welding School, Box P 162, Troy, Ohio.

BEGINNERS—Writer's courses booklets etc. T. E. Hlobik, 106 Washington Ave., Oakmont, Penna.

SCHOLARSHIPS. Complete university training at home for business and social success. University Foundation, PS, St. Augustine, Florida.

HAVE an office of your own! Learn Collection Agency business by correspondence. Many proprietors earn \$5000-\$15000 annually. Write for free bulletin. Franklin Publishing Co., Dept. P.S., Roanoke 7, Va.

LOCKSMITH Course. Lock-picking, key-fitting, etc. \$1.00 prepaid. Miller's Key Shop, Canadian, Texas.

TYPEWRITER Repairmen urgently needed. Earn \$40 to \$50 weekly spare time. Our easy to learn home study course teaches how to repair typewriters. Write for free information. Houston Typewriter Repair Service, P.O. Box 5357B, Houston 12, Texas.

HYPNOTIZE anyone. Learn elementary psychotherapy. Exciting experiments in hypnoanalysis. Cure insomnia, smoking, drinking, stuttering. \$1 Postpaid. Schwartz, 71-01 35th Ave., Jackson Heights, New York.

PLASTIC Engineering pays big. Home study course. Low cost. Easy terms. Free booklet. Ohio Institute of Technology, Box X-279, Greenville, Ohio.

MATHEMATICS: Arithmetic; Algebra, Geometry, Trigonometry, Physics, Drafting, Architectural, Mechanical, Electrical, Structural, Building Estimating. Coach Licenses: Professional Engineer, Architect, Surveyor, Electrician, Plumber, Stationary, Refrigeration. Mondell Institute, 230 W. 41st, N. Y.

IMPROVE handwriting. Improve business, social standing. Send handwriting. \$1.00. David Kushner, 2180 Wallace Ave., N.Y.C.

NEW, Used, Educational Books; Courses. Catalogs, dime; Refunded. Westway Educational Service, Box 58-D, Los Angeles 35.

LEARN Piano Tuning. Prepare for Career in fascinating profession. \$5000. year easily earned. Real security, pleasant easy work. No profession Paying so well can be mastered so quickly. Natural Aptitude, desire to get ahead chief requirements. Prospectus and full information on request. Harmony School of Piano Tuning, Box 582, Harrisburg, Pa.

BOOKKEEPING Course—\$1.00. Spradlin Sales, 708½-B Garrison, Fort Smith, Arkansas.

MILLION Dollar Mind. Stamp, 158 Woodlawn Circle, East Hartford, Conn.

LET yourself go! Dare to be somebody and get somewhere. Achieve self-confidence, influence, creative ability, better health, earn more. Write for our Personality-Developing Plan. We get results or your money back. Personal Psychology, Inc., 1008-1009 Washington Bldg., Louisville 2, Ky.

1946 GOVERNMENT Jobs! Compare \$125-\$220 month. Men-Women. Prepare now at home for examinations. Full Particulars and list positions. Free. Write today. Franklin Institute, Dept. L50, Rochester, N. Y. 4

DRIVE Smoothly. Acquire perfect control from illustrated self-instructions. Excellent for learners. \$3.00 Postpaid. The Brown Driving System, Box 105, Hill Station, Harrisburg, Pa.

GETTING AHEAD is "the thing to do" these days! If your books or courses will help over 700,000 Popular Science readers get ahead, they'll be profitable customers for you! Advertising cost is low. Only 50¢ a word. Full information on request. O. K. Kelly, Manager, Popular Science Classified, 353 E. Fourth Avenue, New York City.

32 ELECTRICAL SUPPLIES & EQUIP

BROKEN—Burned out Electrical Heating elements quickly repaired. Use new amazing Nichrocite Paste, simply overlap ends and turn on current. Family size \$1.00 bill. Satisfaction guaranteed. Armstrong Mfg., Box 861-Y, Minneapolis, Minn.

ELECTRIC Pencil: Writes—Engraves all Metals. \$1.00 postpaid. Beyer Mfg., 4515-C Cottage Grove, Chicago 15.

NICHROME wire and ribbon heating elements. Appliance repair parts. Dealers, repairmen send for circular B. Allstate, Box 434, Worcester 1, Mass.

PISTOL Flashlight—Beautiful, plastic flashlight makes novel gift. Shipped postpaid \$1.00. Myers Chemical Co., 2134 Flatbush Ave., Brooklyn 10, N. Y.

NOW—Repair your own electrical appliances with Chanite Self-welding, Electrical Heating, Element Flux, Instructions, delivered, price \$1.00. Stick from 25c each \$2.00 dozen. Chanite Sales Company, 914 South Main, Fort Worth, Texas.

DESIGN Electric Air-Heaters for pleasure or profit. Instructions, formulas, etc. by electrical engineers \$5.00, includes consultation. Write today. Aircraft Development Co., Box 116, E. East Pasadena, Calif.

ELECTRICAL Appliance Repair. Open your own shop. Learn house wiring, electric motors, vacuum cleaners, washers, etc. Complete illustrated course shows how. Free booklet. Pacific Training School, Dept. AS-1, 4703 W. Pico, Los Angeles 6, Calif.

ELECTRICAL Trouble Shooter finds leaks grounds shorts in anything electrical \$18.50 Prepaid. Free Circular, 811 Q E. 31st, Kansas City 3, Mo.

BROKEN—Burned out Electrical Heating elements quickly repaired. Use new amazing Nichrocite Paste, simply overlap ends and turn on current. Family size \$1.00 bill. Satisfaction guaranteed. Armstrong Mfg., Box 861-Y, Minneapolis, Minn.

POWER rheostats built inexpensively. Instructions 25c. Weist Garage, Deshler, Ohio.

33 EMPLOYMENT SERVICE

INTERESTED Foreign employment? Thousands jobs throughout world. Names and addresses over 200 firms with sample application \$1.00. "We search the world" Wonder-World Research Bureau, Box 731, Gladewater, Texas.

33 ENGINES & MOTORS

MODEL Engines, Castings, Supplies. Catalogue 25c. Howardco, P3-2417 N. Ashland, Chicago 14.

SELSYN Motors: 110 volt, 60 cycle, A.C. Army Surplus. Can be used for remote control, beam antennas, bingo, signaling, wind indicators many other uses. Light weight, high torque. Original Cost \$100.00 pair. Our Price \$20.00 pair. Guaranteed new, original packing. Write for our new bulletin on Rectifiers, Horns and Government Surplus Materials. Met Exchange, 323 Canal St., New York.

WINDING Data, listing 225 motors, single and three phase. \$1.00. Motor Data, Box 7631, Kansas City 3, Mo.

34 FARMS, OTHER REAL ESTATE

OZARK Lands for all purposes. Actual River frontages. 5 acres \$75.00 and upwards. Free list and literature. Hubbard, 424P Minnesota Ave., Kansas City 4, Kansas.

STROUT'S Farm Catalog—Over thousand bargains—25 states—from Maine to Florida, west to California, Oregon & Washington. Write Now for this big 132-page Book Free. Strout Realty, 255-ZB 4th Ave., New York 10, N. Y., 7 So. Dearborn St., Chicago 3, Ill., 453 So. Spring, Los Angeles 13, Calif.

A Six Room House \$2800.00 Complete Ready for You to Move in. Built Anywhere. Send card to Low Cost Housing Co., Box 6, Swampscott, Mass., for free particulars.

HOMESITES—\$450 Convenient payments. California's finest Garden Spot. On Morro Bay's wooded shores. Wonderful fishing, hunting, boating. Fertile soil, soft water, temperate climate, congenial community. Free Literature. Richard Otto, 6560-Z Hollywood Blvd., Hollywood 28, Calif.

\$5 Acre Lands, splendid free stock range, cheap homes, in healthful, fertile, beautiful Ozarks. Free literature. Barnsley, Ozone, Arkansas.

CITRUS country Florida Lands on easy terms. R. W. Stewart, Inverness, Florida.

GOOD Farms — Ranches, Washington, Minn., Montana, Idaho, Oregon, North Dakota. Dependable crops, favorable climate. Write for literature, lists describing typical postwar farm opportunities. Specify which state. J. W. Haw, 60 Northern Pacific Ry., St. Paul 1, Minn.

OZARK farms. Large list free. E. Frank, Mountain View, Mo.

POPULAR SCIENCE OPPORTUNITIES

OZARK farms, ranches, timber, resorts. List free. Farmfinder, Lonsdale, Arkansas.

36 FIELD GLASSES, TELESCOPES, ETC.

REAL powerful 17 power telescopes only \$3. United Co., 2309-E Lawrence, Toledo, Ohio.

"BUILD your own Reflecting Telescope. Complete plan with each kit. Send for free catalog. Mayflower Products, Katonah, N. Y.

REFLECTING Telescopes, complete. 3½" diameter, equatorially mounted. View planets, stars. \$19.75 plus tax. Write Sky-scope Co., 475-5th Ave., New York.

SURPLUS Lens, Prisms, other optical Elements—At Bargain Prices. Catalogue 3c. Laboratory Specialties, Inc., Wabash, Ind.

EFFICIENT, powerful optical instruments easily made. Lenses and instructions for clear seeing, full power astronomical telescopes. 100X \$2.00, 200X \$3.00, 400X \$4.00. For land and sea telescope, 100X \$3.00. For 800X compound microscope \$3.00. Carl Jamer, Manorville, N. Y.

TELESCOPES 18 inch, 2-section, 8 power, precision ground and polished lenses. Individually packed \$1.50. 36 inch, 3-section 17 power, precision ground and polished lenses including carrying case \$2.50 postpaid. Criterion Co., Box 1285, Hartford, Conn.

ASTRONOMICAL telescopes. Microscopes. Cameras, Binoculars, Books: Bought, sold, repaired; Lists 10c; Specify instrument wanted. Rasmussen and Reece, 41 Market, Amsterdam, N. Y.

38 FOR INVENTORS

RANDOLPH & Beavers, Registered Patent Attorneys, 340-E Columbian Building, Washington, D. C. In order to Protect your invention and reap the reward that should be yours. Patent your invention without Delay, and at the same time have Rights to sell as Manufacturers convert to Civilian Production. Write for Information and Record Form To-day.

INVENTORS: Learn now—without obligation—how to protect and sell your invention. Write for free "Record of Invention" form and complete instructions for making disclosure and establishing date of your invention. We also send our new free "Patent Guide for the Inventor", containing complete information about patent procedure and how to sell inventions; giving illustrations of many successful inventions; over 150 basic mechanical movements. We assure you prompt, confidential service. Delays may be dangerous. Write today for your free "Patent Guide" and "Record of Invention" form. Clarence A. O'Brien & Harvey Jacobson, Registered Patent Attorneys, 62A-A Adams Building, Washington, D. C.

INVENTORS: Avoid unnecessary expense. Write for free booklet explaining how our Consulting and Advisory Service can assist you in deriving greatest profit from inventing. Institute of American Inventors, Dept. 30-C, 1926 Eye Street, N. W., Washington, D. C.

WHAT Should You Invent? Our Free Book tells you what today's inventive market wants—how to put down, patent, and sell your ideas. Scores of letters in our files attest to the modern demand for inventions—our long experience as Registered Patent Attorneys will help you. Get our Free Book, "How to Protect, Finance and Sell Your Invention." Also special document free, "Invention Record" on which to sketch and describe your invention. Write today. No obligation. McMorrow & Berman Patent Attorneys, 1434, Atlantic Building, Washington 4, D. C.

INVENTORS—Two Free Books tell you how we can help you secure a patent... give other valuable information. Victor J. Evans & Co., 142-A Merlin Bldg., Washington 6, D. C.

INVENTIONS Having profit possibilities in demand by specific manufacturers, cash or royalty. Free descriptive booklet, protective disclosure form, references, and how to safely disclose an invention for sale, upon request. Invention Reporter, 3A-11106 S. Longwood Dr., Chicago 43.

INVENTORS—We will help you if you have a good idea. We supply the finances to patent your idea in your own name. You own the patent. We also arrange profitable manufacturing connections for inventions. Write without obligation. Patent Financing Corporation, 209G Hospital Trust Bldg., Providence 3, R. I.

APPRAISE Your own invention way manufacturers do. Authentic directions show how Success; Failure is estimated. How manufacturers compute Royalties; prices. Information free. Industrial Management, Seven-B, Randolph Place, Washington 1, D. C.

DEPENDABLE Patent searches—simple inventions \$5.00. Protection form free. Write Raymond L. Smith, Patent Searcher, 410-S Bond Bldg., Washington 5, D.C. (Former U.S. Patent Office employee.)

INVENTORS Make Money when they combine patentability with sound commercial construction. We develop inventions and prepare the patent applications to promote commercial success and secure best patent protection. Patent Engineers, 30 years experience. Development Co., 132 Nassau St., N. Y.

CASH for practical ideas and inventions. Mr. Ball, BB-9441 Pleasant, Chicago.

39 FORMULAS, PLANS, ETC.

FORMULAS—All kinds. Latest money-makers; literature free. KemiKal, Park Ridge, Ill.

AUTHENTIC Formulary, 924 page illustrated book, 10000 scientific formulas, recipes, secrets, instructions for most any product. Countless profitable business opportunities, including D.D.T. new insecticide and our new book: "The More You Know The More You Can Earn". \$2.98 postpaid (c.o.d. U.S. only). Foreign \$3.25 delivered. Adams Brown Co., Dept. 463, Chestnut Hill 67, Mass.

ANTI-Freeze; Gasless Gas; Iceless Ice; All 25c. Duffy, L47, Covington, Ky.

ANY Formula with Procedures \$1. Krall, 1627 Memorial Drive, Dormont, Pa.

PREWAR Tire carcasses everywhere, from these reclaim pure rubber, to make molds, tire-plastic, etc. Details for stamp. Betke, Box 699, Borger, Texas.

MANUFACTURE New Products Inexpensively—Free Literature. Commercial Projects, St. John 1, N. B.

NEED Chemists? Formulas. Analyses. Ideas. Consulting Scientific Co., Swarthmore, Pa.

MAKE your own Mystic Bubble Liquid. Big seller. Formula \$3.00. Master Co., 1702 E. Geneva, Milwaukee 11, Wis.

FORMULAS—Latest, best Analysis. Literature free. E. Belfort, Engineering Building, Chicago 6.

"MEDICAL-Cosmetic and Industrial Formulas Developed. Chemical analyses. Finest. For information write Duncan Laboratory, 1614 S. 14 St., Birmingham 5, Ala.

40 FROG RAISING

"FROG Raising" New Book Tells How Profitable. Marlboro House, 1035 Marlborough, Detroit 15, Mich.

41 FRUITS & FOODS

WHEAT Germ Unexcelled quality 2½ lbs. \$1.00 postpaid. Health-Wheat Co., Rochester 8, N. Y.

Z GARDENING

DAHLIAS My 1946 book lists 400 varieties. Ask for it. Springhill Dahlia Farm, R. 2, Grand Rapids, Mich.

GLADIOLUS 30 Inspected Bulbs, assorted colors. Postpaid \$1.00. Lawrence Boshart, Muscatine, Iowa.

E FUR FARMING

GIANT Chinchilla Rabbits. Valuable Fur. Delicious Meat. Easily Raised. Pleasant Pastime. Tremendous Demand. Small Investment. Large Profit. Willow Farm, R16, Sellersville, Pennsylvania.

41 GAMES, ENTERTAINMENT

ATTENTION Sportsmen! Have fun Kayaking! Complete kits. Easily constructed. Literature. Play-acks, Dedham, Mass.

SALES MEN—New Selling Sensation. Non Skid Checkers. Play anywhere. Trains, planes, bed. They won't fall off. Can't skid. Sample, details \$1.00 Postpaid. Non Skid Products, 59PS Congress St., Hartford, Conn.

AD HANDWRITING ANALYSIS

LEARN Secrets handwriting reveals about your talent, vocations, chances for love and happiness. \$1.00. Mayer, 681 Market, San Francisco 5, Calif.

42 HELP WANTED

GOOD sales positions open. Box 3F, 920 W. Cullom, Chicago 13.

SALES MEN—Executive type. Sell surplus listings business men only. Up to \$100 day. Wire-write quick. War Surplus Reporter, 20 E. Jackson, Dept. 2, Chicago.

DRAFTSMEN — Valuable information. Draftsmen's Club, Box 2207, Cleveland, Ohio.

ENGINEERS — Mechanical and Aeronautical for development and test projects. Recent engineering graduates as well as experienced men required. Apply or write to Wright Aeronautical Corp., Dept. 182, Paterson, N. J.

DRAFTSMEN—Detailers and Checker. Excellent Opportunities. Apply or write to Wright Aeronautical Corp., Dept. 182, Paterson 3, N. J.

WANTED: Experimenters to work with jet propulsion. Write for free literature. Shea, 374 Grant, San Lorenzo 10, Calif.

44 HOBBIES, COLLECTIONS

JEWELRY stones removed from rings, etc., 100 assorted \$2.40; 50 large ones \$2.40. B. Lowe, Holland Building, St. Louis 1, Mo.

UNUSED Match Book Covers, 100 all different \$1.00, 35 Royal Flash Covers \$1.00. Free list. Charles Edelman, 1311 P East 84, Cleveland 3, Ohio.

EXCHANGE duplicates. Swappers everywhere. List free. Box 2166-S, Denver 1, Colorado.

KNIFE Throwing Secrets exposed! Illustrated book tells all. \$1.00 postpaid. "Dean", 1294 E. San Fernando, San Jose, Calif.

440 ANTIQUE Firearms;—4,000 Bargains:—Coins, Indian Relics, Cartridges, Minerals, Rifles, Fossils, Flintlocks, Swords. Catalog with photograph 25c. Heike, Wenona, Ill.

CUT your own gem stones with a B and I Gem Maker. All necessary equipment, less motor and belt, \$29.50 F.O.B. factory. Write for literature. B and I Manufacturing Company, Burlington, Wis., Dept. M.

COLLECT colorful Army Patches. Pictures. Prices and sample patch only 10c. Insignia Mart, 703 Broadway, N. Y.

45 HOME CRAFTSMEN

MAKE Shell Jewelry. Material furnished. Tell-U-How with orders. List free. Dixie Shell Service, Lakeland, Fla.

BUILD and sell Lawn Chairs. Plans \$1.00. We tell you how and where we sell. Woodcraft, Danby, Vermont.

PLASTICS — Plexiglas, Lucite, Bakelite, Lignolite, Lumarith, Tenite. Sheets, tubes, rods, and special shapes. Complete range of sizes. Also cements. Dyes and other supplies. Complete catalog 10c. Carmen-Bronson, 165 E. Third, Mount Vernon, N. Y.

VENETIAN Blinds: Manufacturing Booklet \$1.25 Hardware, Tape, Cord. Catalogue 10c. Roberta, Gloversville, N. Y.

TOY patterns. Circus wagons, trucks, carts, pull toys, etc. 35 patterns \$1.00. Continental Homecrafter, 907 Birch, Eau Claire, Wis.

MAKE Shell Jewelry. Novelties Complete. Supplies Free List. Dollar Kit makes three Brooches. Dixie Shell Service, Lakeland, Fla.

440 ANTIQUE Firearms;—4,000 Bargains:—Coins, Indian Relics, Cartridges, Minerals, Rifles, Fossils, Flintlocks, Swords. Catalog with photograph 25c. Heike, Wenona, Ill.

POPULAR SCIENCE OPPORTUNITIES

CATALOG: Patterns plywood Novelty Furniture - Letters - Numerals - Plaques - Frames - Weathervanes - Silhouettes - Lawn Ornaments. 100 Books & Booklets on Crafts & Hobbies. Picture Frame Mouldings. Tools. Large line Decal Transfers. Other lines. Hundreds articles finely illustrated. Write Wo-Met Shop, Ashburn, Georgia.

PLYWOOD-Deluxe woods for paneling and cabinet work. Bird's Eye Maple, Curly Birch, Havell, Mahogany, Walnut. Thickness 1/16" through 1"; large, small sheets. Complete catalog 10c. Carmen-Bronson, 165 E. Third, Mount Vernon, N. Y.

CASTING: Inventors, model makers, make own designs with easily handled Craft-O-Loy. We cast exact reproduction in metal. Charge by weight. Send \$1. for pound of Craft-O-Loy, directions, price scale. Pacific Alloys, 419 Elkan Gunst Bldg., San Francisco 2.

PLYWOOD Cabinet Kitchen Plans 25c. Playne Cabinets, 4617 Johnson Ave., Western Springs, Ill.

LUCITE Complete Stock all sizes, sheets, rods. Free Listings. Craft Plastics, Box 129S, Somerville, New Jersey.

WHITTLER'S-20 Patterns, instructions. X-acto knife, wood, \$1.00. "Old Whittler," 1402 Charles, LaCrosse, Wis.

WANTED Experimenters to work with Jet Propulsion. Circular on plans. Rush name. John P. Seery, North Conway 4, N. H.

PLASTIC DYES \$1.50 quart, \$4.50 Gallon-Postage-Merritt, 3965 Sedgwick, New York 63, N. Y.

28 LAWN Ornament patterns 25c. Other patterns: 15"-20" high: Dutch girl, Dutch boy, pirate, bull terrier, Mexican girl, Mexican boy, dwarf, penguin, flower girl, 10c each; 3 for 25c. 25 novelty patterns 30c. All 62 full size patterns \$1.00 postpaid. Strother, Box 383-GB, Belington, W. Va.

TOY Patterns. Table and chairs, Doll Stroller, Colonial Cradle, Circus Group, \$1.00. List 10c. Modern Woodcraft, Saginaw, Mich.

LIQUID Wood. Stronger than wood itself. Non-shrinking. Has a thousand uses around the shop. Kit \$1.00. Frank J. Ives, Coopersville, Mich.

TOYS Easily made from scrap wood, 15 Patterns 25c. 25 Novelty Patterns 25c. 15 Lawn Ornament Patterns 25c. Complete Plexiglas Construction Kit only \$1.25 Postpaid. Lynds, Medway, Mass.

MONEY In Plastics. Plastic Kit contains 2 lbs. Lucite Sheets Coloring Dye and Cement with instructions. Send \$2.50 to Plastic Specialty Co., 192 Lexington Ave., NYC, N. Y.

MM INFORMATION

DRUNKENNESS Is a disease which responds to treatment. Medical skill plus human sympathy prove successful with liquor and drug cases. 60 years experience. Write for free booklet. P. S. Nelson, The Keeley Institute, Dwight, Ill.

WHOLESALE Sources, Any Item. Addresses Supplied. "Service", 1332 Findlay, New York City 56.

UNRATED Surplus Army Jeep Tires. 6.00 x 16-6 ply tires to be disposed of. For important information and addresses of government disposal offices, send one dollar to: Consumers Procurement Service, Box 308, Hancock, N. Y.

GENERAL Exchange Service Filing and Information. A service for use in the exchange of articles or correspondence, job hunting, help hunting, help seeking, business exchanges, hobbies. We have a service that unites people for mutual benefit. inexpensive, interesting, profitable. Write for forms and information. FanI, Box 1710, Greensboro, N. C.

47 INVENTIONS WANTED

MANUFACTURER desires postwar products to make and sell through drug, hardware, department stores and mail order. Or will handle sales only. Reputable, nationally-known organization capable of promoting nationwide sales as well as manufacture of items. Prefer non-electrical products of metal, glass, plastics, etc. Write, Box AM6, care Popular Science Monthly.

WANTED-Patented, unpatented inventions having profit possibilities, all kinds. If will sell, reply immediately. Descriptive booklet, references, free. Invention Reporter, 3B-11106 S. Longwood Dr., Chicago 43.

INVENTORS: Have you a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 3-C, Washington, D. C.

CASH for Inventions-Patented, unpatented. Mr. Ball, BC-9441 Pleasant, Chicago.

INVENTORS Attention! Have you an invention patented or patentable of a novel electrical or mechanical device? Are you the owner of dies you wish to dispose of? If you have either or both give full particulars. We are a highly rated manufacturing concern with a nation-wide distributing organization. Your rights will be scrupulously respected. Lion Manufacturing Corp., Dept. BP, 2640 Belmont Ave., Chicago 18, Ill.

WANTED: Practical inventions for marketing through chain, drug and cigar stores. Particularly desire lighters, smokers' articles, etc., in plastic, wood or metal. Write Matt, 1412-GN, Great Northern Bldg., Chicago 4.

INVENTORS! Have you good patentable idea? Write Mr. Metzleer, 11 W. 42nd, N. Y.

WANTED: Practical Inventions. Inventors Patent Exchange, Research Division-D4, Hartford 1, Conn.

CASH for plumbing specialty inventions. Chicago Specialty Mig. Co., 2954 Lawrence Ave., Chicago 25, Ill.

INVENTIONS and Designs Wanted At Once. Patented or Unpatented. Cash or royalty. John D. & Son, Dept. O, 140 Spruce St., Bridgeport 5, Conn.

EE JEWELRY

CERAMIC Jewelry Supplies, Bar Pins, ear screws, for ceramic and woodworkers, also, glass and sea shell assemblers. Free catalog. Philadelphia Badge Co., 1007 Filbert St., Philadelphia, Pa.

JEWELRY, Gem Cutting, Metalcraft". Fascinating designs for hobbies and moneymaking opportunities. New, complete illustrated book covers cutting, polishing, mounting gems, metal, jewelry work, etc. 287 pages, \$2.95 postpaid. Money back guarantee. Tools, materials supplied. Modern Technical Book Co., Dept. 3MS, 55 W. 42nd St., New York 18.

HAVE you tried jewelry making and repairing. Fascinating and profitable. Send \$1.00 for an assortment of 75 findings such as clasps, links, jump-rings, etc. Die Engineering Co., 154 Nassau St., New York 7.

48 LANGUAGE OUTFITS

29 LANGUAGES by Linguaphone. Russian, Spanish, Portuguese—Direct conversational method for mastering any language quickly, easily, correctly at home. Send for free book. Linguaphone Institute, 54 RCA Bldg., New York, CI 7-0830.

AA LEGAL DIRECTORY

MEXICAN Law Practice, A. B. Flota, Box 236, El Paso, Texas.

50 MACHINERY, TOOLS & SUPPLIES

DRILL GRINDER-Grinds drills to factory accuracy. Calipers with direct reading scales. Circle cutters. New Tool grinder. Lowest prices. Free literature. Factory, 811-A East 31st, Kansas City 3, Mo.

GEARS for inventors, experimenters, model makers, schools, work shops, laboratories, etc. Government surplus made of brass, bronze, dural, steel and stainless steel. 12 matched pairs; 24 gears, bevel, spur and ratchet. List price \$12.00, our price \$2.50. 25 matched pairs; 50 gears, includes larger gears, also sets of worm gears. List price \$30.00, our price \$5.00. 50 matched pairs; 100 gears better assortment, including internal set and worm sets. List price \$75.00, our price \$10.00. Limited Quantity. Order now. Write for our Ball Bearing Catalog. Met Exchange, 323 Canal St., New York.

EXPERIMENTERS-Repairmen — Craftsmen. 400 valuable new springs 75 kinds, numerous sizes, 10,000 uses. \$2.00. Deluxe assortment, \$3.00. Jumbo, \$5.00. Guaranteed. Technico, Box 246, West Hartford, Conn.

EQUIP your home workshop quickly, efficiently, economically by building your own Mill, Shaper, Drillpress, Vise, Bandsaw, Jointer or other metal and woodworking tools. Lewis Castings and Materials are ready to finish, detailed Blueprints show how. Send 10c to cover cost of mailing new Catalog describing 23 items. Lewis Machine Tool Co., P.O. Box 116, Station A, Dept. S-60, Los Angeles, 31, Calif.

WANTED Local shops, home workshops, mechanics, mechanically inclined men and boys. Use engineering company plans to make and install household and auto utilities. Business of your own, or add to present business. Full or part time. Circular on plans. Rush name. Houston Maupin, Tipp City 71, Ohio.

SELSYN Motors, set of 4-2 Differentials. 2 Transmitters, 110 Volt, 60 Cycle, A.C., Special set of 4-\$25.00 used for all remote control. Manufactured by Bendix Aviation. .06 H.P. Westinghouse Ball Bearing Motor, 115 Volt, 60 Cycle A.C., 945-1145 speed \$12.50; Also complete Unit Oil Gear Elevation Hydraulic with .06 H.P. Westinghouse Ball Bearing Motor 115 Volt, 60 Cycle, A.C. 945-1145 Speed with one set of Selsyn Motors and Oil Hydraulic Unit. Complete \$35.00 weight 172 lbs. All charges F.O.B., N.Y. Government Release. Columbo Trading Co. Inc., 304 Canal St., N.Y.C.

NEEDLEFILES Genuine Swiss; circular free. Harkey, 116 Nassau St., New York 7, N. Y.

LATHE Cross-Slide Turrets, twelve tools, positive stop index, uses power feeds. Easily made, only six parts. Drawings, instructions \$2.00. Leicester Small Tool Co., Leicester, Mass.

MACHINE Shop Tools released for private industry. Large floor type drill press \$70. 16" Metal Shaper \$110. 24"- \$140. 26" x 26" x 5' Planer \$170. 3 ft. Radial Drill \$230. 36" Brown & Sharpe Vertical Boring Mill \$260. Nutter & Barnes Cold Saw \$50. Acme 2" Turret Lathe \$340. 16" x 8' Quick Change Lathe \$400. Vertical Slotter \$180. Conversion Parts Co., 277 Adams St., Boston 22, Mass.

HARD-To-Find Equipment, hardware, machines, anything mechanical. Describe your needs. We quote and advise. No obligation. Technical Supply Co., 2180 Amsterdam Ave., N. Y. 32, N. Y.

BUILD Quickchange gear box for 12" Craftsman, 10" Atlas lathes. Complete drawings. \$3.00. No castings required. Stevens Engineering, 2604 Military, Los Angeles 34, Cal.

PEPY Governors make automobile motors power units. \$9.50 up. Circular Harris Machinery, Minneapolis 14, Minn.

DRILL Grinder for twist drills \$2.95. See ad page 273.

51 MAGIC TRICKS, PUZZLES, JOKER NOVELTIES

MAGICIANS, Gambler's secrets exposed. Cards, Dice, Punchboards, Slot Machine. Catalog 10c. Book Co., Box 671, St. Louis 1, Mo.

500 TRICKS you can do! Douglas' famous Catalog of 500 Tricks, now only 10 cents. America's fastest service on magic for pocket, parlor, stage, professional, amateur. Douglas' Magicland, Dallas, Texas.

TRICKY Match Box, it turns around! It stands up! And it opens, most weird, uncanny magic novelty trick. Complete ready to do 25c. The Magician, 2463-K, Kensington Ave., Philadelphia, Penna.

WORLD'S largest professional magic shop keeps you in touch with latest tricks. To receive mailings send 25c for new catalog. Holdens, P-220 W. 42nd St., New York.

MAGIC vanishing card. Throw it into air. It completely disappears, reproduce it later from spectators pocket. Easy to do. Complete 25c with magic catalog. The Magician, 2463-D Kensington Ave., Philadelphia 25, Pa.

POPULAR SCIENCE OPPORTUNITIES

BE a Magician. Large professional magic catalog of latest tricks. 25c. Ireland, F-109 North Dearborn, Chicago.

54 MAGICIANS tricks 50c. Magic Package 25c. Professional Catalogue. List. 200 tricks 25c. Lindhorst Magic Den. 612PM Pine St. Louis, Mo.

VANISHING Quarter and Catalog 25c. Sterling Magic. 347 John R. Detroit, Michigan.

MAGICIAN'S Encyclopedia! Four books! \$1.00; free Bookalogues! Hirsch, Spring Valley 3, N. Y.

DOUBLE TALK. A riot of fun. Learn quickly. Simplified instructions 25c. Illustrated novelty lists included. Cable's Novelty Shop. 3166 W. 25th, Cleveland 9, Ohio.

AMAZING Tricks with dice, magical secrets exposed. \$3.00 to W. Hansen, P.O. Box 1746, Dallas, Texas.

COMEDIANS Needed! Free Instruction! Free Instruction! Kleinman, 25-31-M 30th Rd., Long Island City 2, New York.

25 CARD Tricks and Illustrated Magic List. 10c. Victor Jones, Parma, Missouri.

FREE! Large catalog of magical apparatus if you remit 25c for book "102 Easy Tricks." Robbins Co., 152-S W. 42nd St., New York.

RADAR Penel locates cards hidden in desk not touched by performer \$1.00 Ten Trick Magic Kit \$1.00. Kogel, 6751-B Colbert St., New Orleans 19, La.

AMAZE and mystify your friends with highest quality magic. New catalogue 25c coin. Mazda Magic Co., Mt. Sterling, Ky.

MAGIC: Big 160 page Illustrated Catalog. latest Magic Goods. 25c. For over century we have supplied Professional as well as Beginner. Chicago Magic Co., 2300 N. Mason, Chicago 39.

52 MANUFACTURING

MANUFACTURE Paints. No equipment capital needed. Complete instructions formulas. \$2.00. Industrial Chemist, 1826 Z 60th, Kenosha, Wis.

MODELS, small lot manufacturing, metals, plastics, etc. Milburn, Burlington, Kentucky.

PP MILITARY INSIGNIA

FOREIGN decoration ribbons, list, sample. 20c. Assorted insignia packet, folder. \$1.00. Insigniacraft, 236-28th Ave., N. W., Calgary, Canada.

REGIMENTAL Pins; Embroidered American and Foreign emblems; sample and prices 10c. Insignia Guide 10c. Hobby-guild, 35X W. 32nd St., New York.

O MILK GOATS

MONEY from dairy goats! Booklet free. Introductory 5-month subscription to leading magazine 25c. Dairy Goat Journal, Dept. 668, Columbia, Missouri.

CC MINERALS & PRECIOUS STONES

GENUINE Arizona Rubies (Garnets). Send quarter for packet. Mineral Specimens Company, Box 2651, Phoenix, Ariz.

GEMS, precious and semi-precious, all genuine, from world wide sources. Deal direct, no overhead, save money. Catalog 10c. Hill Co., Route 7-K, Salem, Oregon.

2 GEMMY Moss Agates \$1. Rockhound, Box 555, Grand Junction, Colo.

TWELVE Different Cabachons \$1.25. Thirty rough Mexican opals \$1.25. Dr. Ralph Mueller, Professional Bldg., Kansas City 6, Mo.

53 MISCELLANEOUS

BOY SCOUTS—Campers, U. S. Army Surplus Used Equipment. Pup Tents \$2.95. Can-teens, with cover and cup \$1. Mess Kits 75c. Packs \$1. Complete set \$5. includes cartridge belt. Samet Sales Co., High Point, N. C.

RECEIVE Mails, Samples, Moneymaking Opportunities. Literature. Your name in several mailing lists. 10c. Rodgowski, 3415 Broadway, N. Y. 31.

SOUTH-AMERICAN Opportunities. Profitable Employment. Fertile Lands Free. Mailorder Selling. Interesting information. 25c (Refundable). Vallesm, 395 Broadway, N. Y. 13.

MEXICAN-AZTEC Featherwork Tropical Bird Picture cards. Samples 25c. Bulletin Free. Mexican Products Co., 126 N. Main, Tulsa 3, Okla.

FREE Drug List! Druggist Z. Robins, 24 S. Hamlin, Chicago 24, Ill.

MEDICAL Laboratory Technicians in great demand. We train you in your spare time, in your own home. You can practice while studying. Write for free catalogue. Imperial Technical Institute, Box 973-S, Austin 5, Texas.

GIANT Mails, leading Mail Magazines. Ad-sheets, Opportunities 10c. Harvey Teeple, Decatur, Indiana.

TARAWA! Authentic Unpublished Photos Explanations. \$1.00. Duffy, L44 Covington, Ky.

SQUARE Dance Instructions, calls. 25 sets. \$1.00. Ozarkians, Lonsdale, Arkansas.

GOOD "Used" self-instruction educational books on all subjects bought, sold, rented, exchanged. Satisfaction guaranteed. Complete information and 100-page illustrated bargain catalog Free! Write—Nelson Co., Chicago 5.

UNUSUAL Novelties, samples 10c. Modern, Box 2, Station B, New York 2.

RELEASED! Famous Downmetal (Magnesium grill, Sunday Nite Chef. Even heating for Hamburgs, perfect Steaks, biscuits, cookies, etc. Guaranteed! \$3.75 Postpaid. DonLee Sales, 202 E. Collins, Midland, Mich.

FAW, S. de R. L.—Sales Engineers Association, Apdo. 919 Tampico, Mexico.

TAILORED Homes plan book. Sixty floor plans one-story houses with your selection of Colonial, English, Spanish, Moderne exteriors making Hundreds of Combinations! Price \$1.00. Distributors wanted. H. P. Jones, 486 PS Brandeis Bldg., Omaha 2, Nebr.

CUTTERS. Dental Burs assorted, reclaimed job-lot. \$1.90 per gross. D'Wolf 1924 E. Hartlane, Philadelphia, Pa.

LOST Keys. Pets returned! Beautiful gold Tag (name, Address) \$1.00 (three different \$2.00). MacCormac, Box XX-12, Madeira, Ohio.

50 CLEVER new toy patterns \$3.00. Catherine A. Schieler, Cresbard, S. Dakota.

CARPENTERS—Fast! Accurate! Calculator. Simplifies everything. Postcard brings particulars. Box 1414, Great Falls, Montana.

5 DIFFERENT Curios: \$1.00 Postpaid. South Sea Curios, Grass Skirts, Shell Jewelry, Indian Silverwork, Beadwork, Peruvian Silver; Brazilian Jewelry, Wholesale & Retail. Free List. Southern Cross Trading Co., P.O. Box 2262, Los Angeles 53, Calif.

ARMY GOODS (USED)

RAINCOATS \$1. Bolo Knives \$3.75. Jeep hats and caps 10c. Overseas Caps 10c. Dungarees 95c. Tool boxes \$1. Gas mask bags 50c. Steel Helmets \$1. Gun slings 75c. Holsters 75c. Canteens 50c. Cups 15c. Mess Kits 35c. Leggings 23c. Cartridge belts 50c. Sheepskin Coats or pants \$6.00. Rubber Parka Suits \$2.50. Rubber Wading Boots \$2.95. Rubber life suits complete \$4.95. Portable Spark Coil set \$3.00. Buzzer phone \$2.00. Rubber 25c lb. Minimum shipment \$1. No. C.O.D. N. Y. Salvage, 144 Chambers St., N. Y. C.

SELECTED Products—Yours for better buying. Free circulars. Ives, Box 56, Kensington Station, Brooklyn 18, N. Y.

PERSONAL Publicity wins new friends and success for you. Easy instructions. Write: John B. Martin, 1101 W. State St., Jacksonville, Ill.

NERVOUS? Bashful? "Fears?" Free, encouraging information. Confidential! John A. Englund, Ironwood, Mich.

A PATENTED Hospital item—great sales possibilities. Florence Cox, 112 W. Gray, Norman, Oklahoma.

FREE literature how to locate buried treasure and minerals. Fisher Laboratory, Palo Alto, Calif.

BEAST No. 666 imparts disease, sickness, fear and poverty. Free information on "The Mark Of The Beast." Cedrick S. Moore, 1313 S. Union, Kokomo, Indiana.

REPLACEMENTS—Stoves, Furnaces, Grates, Firepots, Linings, Reasonable. Majprodox, Royal Oak, Mich.

AMAZING New Toy Automatic Hand Grenade, and Nylon Parachute. Opens when thrown into air. 75c postpaid. Bernard Fine, 507 Fifth Ave., N. Y. (P-1).

RECEIVE mails, literature, opportunities. Your name in numerous mailing lists 10c. Greenwood, 277 Broadway, N. Y.

CIGARETTES—all popular brands, order shipped same day received; minimum order 3 cartons. New low price! \$1.35 per carton, including postage. No other costs. Perfect delivery guaranteed. Send check or money order to Ace Mail Order Co., East Orange 82, N. J.

54 MODELS & MODEL SUPPLIES

MODEL Ship Builders! Are you looking for authentic, precision ship models? Send for richly illustrated fully descriptive catalogue in full color of famous ships of all kinds. Only 10c. Marine Model Co., Inc., Dept. C8, Halesite, Huntington, N. Y.

MOST complete Illustrated Catalog—"O-HO OO" Model Railroad Parts ever published. Send 5c for mailing. Selly, 1377 Gates Ave., Dept. 825, Brooklyn, N. Y.

WORLD'S largest selection miniature engine castings and drawings. Illustrated catalogue 10c. Wayne Miller, Engineering Bldg., Chicago.

SHIP and Yacht Model fittings and blueprints. Hundreds of items to choose from. Send for our War Time Supplement. A. J. Fisher, 1002 Etowah Ave., Dept. W-S, Royal Oak, Mich.

SHIP Model and yacht supplies, complete large 64 page catalogue, 25c. Wm. Wild, 510 E. 11th St., New York City.

BOAT Models, P. T., Cabin Cruiser, Speed-boat. Free Circular. All Star, 2003 Lincoln Ave., Chicago 14.

SHIP model kits and fittings. Complete line Fisher model yacht equipment. All Boucher, Fisher, Marine Model and Ideal Kits, fittings and blueprints at standard prices. Most complete stock in New England. Send 10c for price lists. James Bliss & Co., Inc., 220 State St., Boston, Mass.

BIG Illustrated model engine catalog 10c. Active Products & Supply Co., 53 W. Jackson, Chicago 4.

1001 Items-for Model Builders, Air-Land-Sea! Catalog 15c. International Models Products, 879 8th Ave., New York 19.

JET Propulsion! Experimenters! New plans to drive Boats, Bicycles, Model Planes. Rush postcard for circular. Phil Hopkins, Union 6, N. Y.

BRASS Gears and model supplies for the inventors. Send 10c for Catalog. Pierce Model Works, Tinley Park, Ill.

MODEL Builders and Hobbyists. Send 25c (includes refund coupon) for 68 page 8½ x 11 Master Model Airplane and Gas Model Catalogue. General Modelcraft Co., Dept. S1, 91-17 173rd St., Jamaica 3, New York.

CATALOGS (Illustrated) for Modellers! Airplanes: 60 page book on Solids. Features construction data, specifications, camouflaging. 15c; Railroads: 128 page "HO" guide. Equipment, accessories, fittings, 25c (includes refund coupon). Send coin or stamps for each profusely illustrated catalog desired. Polk's, "Nation's Leading Hobby House", 314-P Fifth Ave., N. Y. C., 1.

STEAM engines boilers castings blueprints circulars 10c. Anton Bohaboy, 2297 Price, Rahway, New Jersey.

MODEL Kits and Supplies. List 10c. Badger Hobbycraft, 823 S. Second St., Milwaukee 4, Wis.

RAILWAY Models, complete line, informative catalog HO and O Gauge 79 pages 25c Walthers, 269 Erie, Milwaukee, Wisc.

55 MONEY-MAKING OPPORTUNITIES

DETECTIVES earn Big Money. Experience unnecessary. Particulars free. Wagoner, P-125 West 86th, N. Y., N. Y.

POPULAR SCIENCE OPPORTUNITIES

MECHANICALLY INCLINED MEN—Own and operate general Appliance Repair shop. Complete, illustrated course shows you how. Welding, Refrigeration, Motor repair. How to get business, etc., all phases covered. Free literature. Christy Supply, Dept. 1459, 2835 N. Central Ave., Chicago.

EARN money at home! Thousands do! "Home Worker Magazine" tells how. Sample, 25c. Sizemore, Box 6, 4917 North Kostner, Chicago.

PUT up powder and liquid-fast repeating products under your name. Large profits. Kohnn, 506 W. 45th, Chicago 9.

A \$100-a-month hobby at home! No soliciting, no mail order, no meeting people. Easy, enjoyable pastime. Details, 25c (refundable.) Laura Dickson, 241-PS Main Building, Lander College, Greenwood, S.C.

FREE literature. Small business of your own. Lynch, 462-SM Hazlett, Baltimore 29, Md.

GIANT MAIL: Trade magazine; opportunities galore. 10c. Jackson, Newfoundland 4, Ky.

FIFTY moneymaking plans for everyone. Sample copy 25c. Reddick, Vimy St., Oshawa, Canada.

500% PROFIT puncture proofing tires. Details for stamp. Betke, Box 690, Borger, Texas.

EARN Money evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 2, Wis.

\$10,000,000 FREE—Annually—Prize Contests. Win Fortune. We help you. Best help possible. Any Contest. Lowest Rates. Bulletin, Free. Cash Register, 210 Fifth Ave., New York 10.

EARNINGS, \$2,000 year easy; inventing simple items for special cash markets. Ideas only. No patents. Write. Hendrickson, Argyle 8, Wis.

WIN Financial Independence. I'm helping thousands. Dr. Tibolt, 42A, Phila. 20.

NOVELTY Manufacturing offers splendid opportunity to start highly profitable business. No expensive equipment, orders waiting, big profits, easily learned. Definite post war future. Plastex Products, 127 Clement St., San Francisco 18, Calif.

PRIZE Contest Fans Can Win A Fortune! Free announcement service! Good news for untalented contestants! Write today! National Contest Bulletin, Box 634-M, Grand Central Station, New York City.

START profitable home business now capitalize spare time free details. Manhattan House, 126P Lexington, New York 16.

HALF pound big mail, 10c. Thomason, 857 E. Jessamine, Fort Worth 3, Texas.

ELECTRIC Clocks are every where you go, buildings, homes, parking-lots, factories. Repairs increasing. Our easy to learn course with pictures and drawings teach You how to repair these clocks. Electronic Supply Co., Box 2350-B, Houston 1, Texas.

DDT Insect Sprays. Huge Market! Unbelievable Profits! Easy made. Formulas \$1.00. Lowe, Box 332, Clinton, Mo.

\$1 MATERIAL brings \$20.00. Unlimited possibilities with concentrate cosmetics. 50c value sample 10c. Money Back. Kohnn, 506 W. 45th, Chicago 9.

START your own business! Big money manufacturing novelties, plaques, statuary. Details free. Write—Bing Products, 621-BC Tremont St., Boston 18, Mass.

300 MONEY Makers 25c. Home Service, Box 855PS, Des Moines 4, Iowa.

INTERESTED in steady extra income? Write Demonstrators, 1743 Harrison, Chicago.

A LITTLE story of a Big Success—How \$20 can make \$100. For details send your name and address to Lee Sherman, 1314 16th St., N.W., Washington, D.C.

LEARN Metascience. Remarkable drugless healing. No manipulation. No apparatus. Unbelievable simplicity and results. Inexpensive correspondence course. Write Metascience, De Land, Florida.

"READ How to Go Into Business For Yourself" 64 pages of eyeopening information, rush one dime, George C. Simon, 6843 Jonathon, Dearborn, Mich.

PROFITABLE Mail Order (local) Business in your Home. Stamp brings literature describing 125 proven plans. Kessier National Service, Box 392-PSJ, Indianapolis 6, Ind.

QUICK! Start getting quarters, dollars by mail immediately—all yours. 100 All Profit circulars Free. Reliable firm. Honest, Legitimate, Honorable. Practically no capital. Only 25c may bring you dollars immediately. Profit Builders, 305-D-W, 8th St., Los Angeles 14, Calif.

YOUR Money Making Opportunities are wanted by over 689,903 Popular Science readers! Advertise here for real results! For full information, write today for information. Classified Section, 11th floor, 353 Fourth Ave., New York, N.Y.

X MONUMENTS

WRITE For Direct Prices \$14.00 Up. Freight Paid. Guaranteed. Free Catalog. Granite-Marble Factory, A49, Oneida, Fla.

56 MOTION PICTURES & SOUND EQUIPMENT

FEATURE sound programs—shipped anywhere \$4.95 complete. Free Catalog. National Cinema Service, 71 Dey St., New York.

BEAUTIFUL Kodachrome Slide and List. 25c. Art Slide Co., S-1, Canton, Ohio.

SEND stamp for 16mm, 8mm catalogue. Sterling's, 679 Northampton, Easton, Pa.

TAKE your Christmas Movies Indoors 100' 16mm \$4.25—100' outdoor 16mm \$2.25. Ambassador 479-A Quincy St., Brooklyn, N.Y.

SENSATIONAL full color movie subjects! 8 mm., 16 mm. Big catalog 25c. Special! Projection length sample scenes (Kodachrome), "Waikiki Hula", \$1.00. Specify width. Iriscope Kits, \$5.00. World in Color Productions, Box 392-A, Elmira, N.Y.

LEARN movie projection, management. Free catalog. Theatre School, Elmira, N.Y.

MOVIE projectors bought and sold. List 10c. United, 2309-A Lawrence, Toledo, Ohio.

35 MILLIMETER sound films for sale. Will trade for 16 millimeter sound film and machines. Mertz's Films, Springfield, Ill.

MOVIE Camera Films. 100' 16mm \$2.50, 25' Double 8mm \$1.25. Free Developing. Better Films, 742 New Lots, Brooklyn 7, N.Y.

HOME Movie Rental, Sales, Exchange. 8-16mm and Sound. Latest Releases—Money-Saving Rates. Details for Stamp. Midland Film Exchange, Box 429, Oak Park 3, Ill.

ATTENTION Home Movie Fans! Send for Our Free Illustrated Catalog of Camera Film, Subjects, Supplies, Rental Library. Lowest Prices! Solar, 4247 So. Kedzie, Chicago 32, Ill.

WORLD'S Greatest Clock 6000 pounds 15000 parts 16mm silent 125 feet \$4.50. Nu-Art Films, 145 W. 45th St., New York City.

OLD-TIMERS — Comedies, Mellerdramas, 8/16mm, Silent, Sound. Sold, exchanged. Meginnis, 340-W W. 29th, New York 1.

"THE World's Greatest Passion Play", All sizes, Rent or Purchase. Write Hemway Film, 33 Z Melrose St., Boston 16, Mass.

UNUSUAL 8-16mm film subjects. Big Catalog with sample film, 10c. National Film Exchange, Sta. E-Broadway, Toledo, Ohio.

GUARANTEE fresh movie film! Three spools double 8mm., \$3.45! Six spools single 8mm. for Univex cameras, \$3.50! (Limit six spools each type.) Processing free! Will send C.O.D. on \$1.00 deposit. State make of camera. Eso-S, 4038 Broadway, Kansas City 2, Mo.

UNUSUAL Home Movies:—Travel, Comedy, Adventure, Sports, News War film. Many film bargains. Big 1946 Catalog and sample. Dime, Audet, Box 6520-AG, Philadelphia 38, Pa.

8-16mm SILENT-sound films. Complete rental library. All latest subjects. Free catalogue. (sample film 10c). Garden Film, 317 W. 50th, N.Y. 19.

TAKE finer movies. Professional instruction at home. Free Catalog. Motion Picture Institute, Birmingham 5, Mich.

FREE, 1946 catalog: Movies, sample films, 10c. Enlargers, Printers, Cameras, Films. Goodwill Company, Jackson, Tenn.

DEALERS! Want more business? Advertise your films or equipment in this column. Read by enthusiastic photography-minded Popular Science readers—689,903 every month! Write for folder information today. Popular Science Classified, 353 Fourth Ave., New York City.

16mm-8mm FILMS Bought, Sold Exchanged sound and silent. The Film Exchange, 154 Nassau St., N.Y. 7, N.Y.

FILM: Free Processing, 25ft Double 88 Weston 6, \$1.35; Weston 24, \$1.89; Weston 64, \$1.99. 100 ft 16mm Weston 6, \$2.50; Weston 24 \$4.85; Weston 64, \$4.95. Write for Circular. Fromader Genera, Davenport 5, Iowa.

57 MOTORCYCLES, BICYCLES & SUPPLIES

LARGE stock Indian parts. Expert motor rebuilding. Indian Motorcycle Sales, Kansas City 1, Mo.

PARTS, Accessories, Pistons Chain, Harley Davidson Motorcycles. George's, P.O. Box 114, El Paso, Texas.

WHEELS, Tires, Tubes for Motor Scooters, Midget Cars, Wheelbarrows, and Industrial equipment. All sizes. Bicycle Parts, accessories. Largest stock in United States. Send dime for list. Cycle Transport Company, 1241 S. Michigan Ave., Dept. C, Chicago 5, Illinois.

"MODERN Motorcycle Mechanics" enlarged, revised, second edition, 560 pages, 300 illustrations. The most up-to-date and complete motorcycle book published. Extensively covers design, operating and servicing Harley-Davidson, Indian and English makes. Price \$3.00 postpaid. Nicholson Brothers, Motorcycle Engineers, Saskatoon, Canada.

1942 CUSHMAN Motorscooter \$60; Briggs-Stratton Motorbike \$45; Midget car \$30; Briggs-Stratton motor \$10, other motors as low as \$3.50; plenty of tires for motorscooters and small cars at factory prices. (Mailorder Only). Send 25c for Big Bargain catalogue Number Ten listing hundreds of bargains in motorscooters, midget cars, tires, parts, etc. (35c by first class mail.) Midget Motors Directory, Athens, Ohio.

BUILD America's lowest priced motor-scooter speedster! Complete plans, specifications, \$1.00. Big list used motors, etc. included free! Motor Supply, Box 1682-CS, Toledo, Ohio.

PROFESSIONAL Midget Racer, Motor-scooter, Midget Roadster, and Midget Motorcycle. Plans, specifications for all four contained in illustrated handbook, 25c. Big list used motors, motorscooters, Servicycles, etc., included free! Midwest, 3839 Drummond, Toledo, Ohio.

FLOYD Clymer's Motorcycling Manual. 120 illustrations. Information, specifications, descriptions dozens motorcycles. Engines, transmissions, carburetors, square four, two piston singles, overhead camshafts, spring frames, hydraulic forks, sidecars, riding instructions. Two cycle engines and power bicycles described. Illustrated. \$2.00 postpaid. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

FLOYD Clymer's popular motorcycle, automobile books. See advertisement under Automobiles! Clymer, 2125 W. Pico, Los Angeles 6, Calif.

ENGLISH "Motorcycling" Magazine. Interesting, educational, foreign motorcycles. Racing, new-old models, advertisements, 50c sample copy. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

TIRES, Tubes, Wheels, for industrial trucks, carts, wheelbarrows, scooters, midget cars, coaster wagons. Nationally known makes, first-line quality. Sizes 8" to 18" o.d. in 2, 4, and 6 ply tires, separate inner tubes. Heavy duty demountable wheels. Also Caster Forks, straight and swivel types. Free illustrated circular and prices. Jahant Co., 626 E. Exchange St., Akron 6, Ohio.

POPULAR SCIENCE OPPORTUNITIES

PLANS. Scale drawings, specifications, illustrations for building attractive motor scooter complete \$2.00; plans electrically driven bicycle \$1.50. Postpaid. Clymer, 2125 W. Pico, Los Angeles 6, Calif.

58 MUSIC, MUSICAL INSTRUMENTS

PLAY Swing Piano! Send 10c for instruction bulletin. Christensen Studios, 765 Kimball Hall, Chicago 4, Ill.

SONG Poems Wanted, for musical settings. Send poems for Free Examination. Write for Free Instructive Booklet outlining Opportunities. United Music Corporation, Salem 12, Indiana.

CROSS-Note Puzzles Music-Lover's Delight. Interesting, Instructive, Original. \$1.00. P.P. M.B. Guarantee. D'Aleo, 190 Sackman St., Brooklyn 12, N.Y.

MUSICAL instruments wanted. We pay highest prices! What have you? Cash waiting! Trump Music, Mount Vernon, N.Y.

HARMONICAS (C) \$2—Double row \$3. \$5. \$7.75 Guitars—Drums \$10 up Free list. Musician's Shop 2 E. Centre St., Baltimore 2, Md.

GUARANTEE to teach you to play Spanish or Hawaiian Guitar in 10 lessons—One Dollar. Frank's Musicians Supply, 732 Jersey Ct., San Diego 8, Calif.

SONGS arranged and scored. Melodies composed for lyrics. Workmanship guaranteed. Write for particulars. Tommy Kilbourne, Box 1253, Bakersfield, Calif.

50 DIFFERENT used juke box records \$6.00. Davis Sales, 625 Erie Blvd., E. Syr., N.Y.

AC NAME LISTS

MAILORDER Buyers Lists—Fresh—Certified Productive, Inexpensive. Free Prospectus. Dixie, King, N. Carolina.

FREE List: Books, tricks, songs, bodybuilding. Howard Co., 141-45-71 Ave., Flushing, N.Y.

59 OLD GOLD, WATCHES, ETC.

GOLD \$35.00 Ounce—Mail old gold teeth, diamonds, jewelry, watches—receive cash by return mail. Satisfaction guaranteed. Free information. Dr. Weisberg's Gold Refining Co., 1500-B Hennepin, Minneapolis, Minn.

B OLD STAMPS WANTED

WHAT have you to offer? A collection? A "Shoe Box" accumulation? Anything in stamps. We urgently need them. Spot cash paid. Cosmopolitan Stamp Co., 1457 Broadway (Times Square), New York.

I WILL pay \$100.00 each for 1924 1c green Franklin stamps, rotary perforated eleven (up to \$1,000.00 each unused). Send 6c today for large illustrated folder showing amazing prices paid. Vernon Baker, PS-61, Elyria, Ohio.

TOP Prices Paid for V. F. well centered U. S. stamps. Law, Box 725, Lynn, Mass.

61 PATENT ATTORNEYS

PATENTS Secured. Two valuable booklets, "Patent Protection" and "When and How to Sell an Invention", together with valuable "Evidence of Invention" form sent free. Write immediately to experienced patent counselors, Victor J. Evans & Co., 141-A Merlin Bldg., Washington, D.C.

PATENTS Obtained; selling service. Information, recording forms free. Labiner, World Building, New York 7.

INVENTORS: Learn now—without obligation—how to protect and sell your invention. Write for free "Record of Invention" form and complete instructions for making disclosure and establishing date of your invention. We also send our new free "Patent Guide for the Inventor," containing complete information about patent procedure and how to sell inventions; giving illustrations of many successful inventions; over 150 basic mechanical movements. We assure you prompt, confidential service. Delays may be dangerous. Write today for your free "Patent Guide" and "Record of Invention" form. Clarence A. O'Brien & Harvey Jacobson, Registered Patent Attorneys, 62B-A Adams Building, Washington, D.C.

PATENT Protection. Write for information. Fees. Record of Invention. Free. Randolph & Beavers, 340-A Columbian Bldg., Washington, D.C.

PATENTS—Trade marks. Preliminary advice, and disclosure form free. Personal service. Irving L. McCathran, 316 McLachlen Bldg., Washington 1, D.C. Registered Patent Attorney.

WHAT Should You Invent? Our Free Book tells you what today's inventive market wants—how to put down, patent, and sell your ideas. Scores of letters in our files attest to the modern demand for inventions—our long experience as Registered Patent Attorneys will help you. Get our Free Book, "How to Protect, Finance and Sell Your Invention." Also special document free. "Invention Record" on which to sketch and describe your invention. Write today. No obligation. McMorrow & Berman Patent Attorneys, 1433 Atlantic Building, Washington 4, D.C.

FRANK Ledermann, 154 Nassau St., New York 7, N.Y. Registered Patent Attorney since 1918.

C. A. Snow & Co., S-427 Snow Bldg., Washington 1, D.C. Registered Patent Attorneys. Established 1875. Literature mailed on request.

INVENTORS: Before disclosing your invention to anyone send for Form "Evidence of Conception"; "Schedule of Government and Attorney's Fees" and instructions. Sent free. Lancaster, Allwine & Rommel, Registered Patent Attorney, 413 Bowen Building, Washington 5, D.C.

PROTECT your invention through medium of my expert personal service. Preliminary information without obligation. Horace L. Beall, 902 F Street, N.W. 4, Washington, D.C.

62 PATENTS FOR SALE

ROUND Ice, freezing tray right size to drop in vacuum bottles, light metals, die casting, project, perfected. Royalty. Roy M. Cummins, 1225 Rowe St., Akron 11, Ohio.

PATENTS for Sale: Manufacture beautiful and salable Game appealing to both young and old excellent profit possibilities. I have over 300 Local orders for this Game. Inventor H. C. Perrin, Route 1, Box 308-A, Grass Valley, Cal.

APPARATUS for cleaning ceilings. Patent, 2093-289. Gus Lundquist, 203 St. Johns Pl., Brooklyn.

63 PERSONAL

DRUNKENNESS Is a disease which responds to treatment. Medical skill plus human sympathy prove successful with liquor and drug cases. 60 years experience. Write for free booklet. P. S. Nelson. The Keeley Institute, Dwight, Ill.

LONELY People Everywhere are finding real happiness through introductions by mail. Particulars sent Free, sealed. I'll show you proof. Nancy Jordan, P.O. Box 466, San Francisco, Calif.

MAKE new friends thru old reliable club. Free book with photos of members. Correspondence confidential. Exchange Company, 3827-PS Main, Kansas City, Mo.

LONESOME? Get acquainted this easy way. Confidential sealed particulars 25c coin. Box 310, Memphis, Tenn.

LONESOME Get acquainted with hundreds of members. Confidential free particulars. Lone Star Club, P.O. Box 923, St. Louis, Mo.

REJUVENATION! Also Diabetes without needle. Home treatments. Healthotel, South Whitley, Indiana.

PSORIASIS Sufferers: Has everything failed to bring even temporary relief from scales, lesions and itching? Then write today for Free important information. You needn't invest one cent! Pixacol Co., Dept. S, Box 3583, Cleveland, Ohio.

WIDOW and Widowers Club. (Confidential details 25c.) Write John Rankin, Springfield, Missouri.

HAIR Falling? Dandruff? Write Trichologist, 139 Lewis Street, Phillipsburg, N.J.

LIVE Longer, feel better, enjoy life. Free information. Fairchild Co., Mt. Vernon, Ohio.

STOP Baldness, Dandruff. Interesting Literature. Write, Aurback, 2345 Ocean Ave., Brooklyn, N.Y.

NOISESTOPPERS insure quality sleeping, improve health. Write Raymond Dow, 17 Park Row (A1216), New York 7. Get free illustrated health secrets.

ATHLETE Foot Remedy Guaranteed. \$1.00 bottle prepaid. Medically recommended. Dr. W. J. Renz, Rm. 3, Chavanne Bldg., Lake Charles, La.

LONESOME? Join America's fastest growing club. Free sealed particulars. Capitol Club, 3439-D S. Michigan, Chicago 16, Ill.

LONELY? Confidential particulars free. Let America's largest club help you. Blair Club, 4554J Broadway, Suite 374, Chicago 40, Ill.

YOUR Name in Silver on 100 Matchbooks \$1.25. Brookside Press, Antrim, N.H.

LONESOME? Free particulars nations' wealthiest. Arlington Club, Seven-B Randolph Place, Washington 1, D.C.

LEARN Ventriloquism. 3c stamp brings particulars. Smith, Dept. 227, 801 Bigelow, Peoria, Illinois.

YOUR Penmanship improved in 3 hours—New-Way. Write, Ozment, 15, St. Louis, Mo.

LONELY? Dependable register for social correspondence. Miss Chase, Box 172, Seattle 11, Washington.

HAVE Penpals worldover. Illustrated Magazine with list 10c. World Card Club, King, N.C.

ROMANTIC Publication—150 Names, Addresses, descriptions lonely people wishing correspondence. 35c. Year \$1.00. Cupid's Magazine, Box 171, McKenzie, Tennessee.

SWAP: Trade. Free List. "Swappers' Gazette", 2836-S Slevin, Louisville 12, Ky.

GET Acquainted Club—Through social correspondence thousands yearly meet their "ideal". Write for list of eligibles. Many in your State. Simpson, Box 1251, Denver, Colorado.

WANT New Friend's? Let nation-wide Cupid's Destiny help. 50c. Weston, Box "F", Pacoima, Calif.

LONELY? Join Tower Club. Details, Stamp, Box 444-P, Kansas City, Mo.

PILES relieved quickly, inexpensively. Oral Deaton, R-2, Marion, Ill.

LEGAL Matters in Mexico. Fred Morales, Box 449, Tijuana, Mexico.

LONELY Ladies, many have homes, farms, good positions. 100 names, addresses, descriptions, 45c. Frank Shilling, 1017-M Dueber, Canton 6, Ohio.

LONELY Hearts Club That's Different! Introductions by letter. Confidential, Dignified, Honest service. Particulars free. Lester Holliday, H-1514 Long, Columbus, Ohio.

YOUR Career or Job Problems can be Solved. Tested Proven Methods. Career Counsellors, Trenton 1, N.J.

BE Lonely No More! Open Destiny's Door! 50c Brings Cupid's Destiny. World's Greatest Social Publication, including nationwide names, addresses; either sex. Captivating descriptions; sparkling pictures—widows, widowers, bachelors, beautiful girls desiring early marriage. (Year, bi-monthly, \$1.00.) Mention your age. Destiny League, Aberdeen 75, Wash.

LONELY? Really Big Lists. Descriptions, Photos Galore, men-women. 10c (coin) None Free, (State Your Age?) Jack P. Painter, Box S-966, Akron 9, Ohio.

HYPNOTISM. Complete 20 Method Course. 25c. Western Institute Hypnotism D-1619, Palatine, Ill.

HEALTH. Prosperity, Happiness through Right Thinking. Information Free. Joseph Louis Schertz, Ps.D., 5338S Bartner Ave., St. Louis 12, Mo.

POPULAR SCIENCE OPPORTUNITIES

MAIL forwarded. 25c confidential. Jay Service, Box 2759, Cleveland 11, Ohio. LONELY. Have romance, companionship thru correspondence. Particulars free. Pearl Smith, Box 2732, Kansas City 13, Mo.

LONELY? Plain sealed details free. Largest Club in West. Endorsed by ministers. Club Elite, Box 71, Los Angeles 53.

NERVOUS? Bashful? "Fears?" Free, encouraging information. Confidential! John A. Englund, Ironwood, Michigan.

SLEEPLESSNESS Unnecessary—Sleep-Rite Earstoppers insure quality sleeping, improve health. Write Raymond Dow, 17 Park Row (B1216), New York 7. Get free illustrated health secrets.

LONESOME? Get "Cupid's Mail". Many wealthy. (Stamp). Excel, 2149 Jackson, Chicago 12, Ill.

LONELY Hearts—Join our club, find your ideal. This high class club gives confidential dignified and unexcelled service. Sincere people write Box 1555, Dallas, Texas.

MEET New Friends through our Personal Introductions. Original personal service dedicated to promotion of interesting friendships. Established 1935; discriminating clientele, all religious faiths. Phone Grace Bowes or visit us at our office any weekday. American Service, 236-PS W. 70th St., New York City, Phone Endicott 2-4680.

LONESOME! Descriptions and details free. Big lists. ACME, Box 192-S, Aloha, Oregon.

PIMPLES Disappear overnight. I tried everything till I found this formula. \$1.00. Morean, Box 243, Lowell, Mass.

MAIL forwarded from Houston, Texas. Confidential. Letters 25c. 411 East 27th St., Houston 8, Texas.

CHECK Up! Any handwriting expertly analyzed by a Trained, Authorized Analyst. Character, emotions, ability, talents revealed. Send 25c coin and handwriting to: Grapho-Analyst, 422 Smith Tower, Seattle, Wash.

HOW to Prevent Baldness. Simple. Will wonder you hadn't thought of it before. Send \$2.00 for booklet. If not satisfied with results, will return your money. L. F. Robinson, M.D., 815 Pendleton St., Greenville, S. C.

WILL the Peace Last? 10c. Bulletin, Box 67, Station H, New York 25.

FREEDOM from Loneliness. Does your life lack something? Lonesome for someone with like aspirations? Congenial introductions by letter. Nationwide. Free details. Christines, 4106PSM Prospect Ave., Hollywood 27, Calif.

GRACE Turner's "Scars-Off" for relief of Acne scars—all superficial scars. Safe, effective. \$2.00 Postpaid. Pharmacist, 312½ Redondo Ave., Long Beach 4, Calif.

MATRIMONIAL — Sweetheart magazine—Photos, descriptions, addresses. 35c year \$1.00. Barwood, 2037 E. 42nd, Astoria, N. Y.

64 PHOTO FINISHING

MONEY Back Guarantee—16 Sparkling double clear Nu-Art Prints, also 2 Enamel Finish Enlargements. All complete 25 cents. Rolls or negatives. Prompt, Careful. Guaranteed. Lifetone Studios, Dept. 408, Des Moines 8, Iowa.

YOUR 6-8 Exposure Roll Developed and Two prints each good negative 30c; Or enlarged to about Post Card size 8 Exposures 25c. 12 Exposures 40c. 16 Exposures 50c. Rapid Foto Service, G.P.O. Box 413, New York 1, N. Y.

AT Last! Roll Developed, all your snapshots hand-colored as beautiful as most actual colored photography 35c. Hand colored reprints 4c each—12 for 45c. National Photo Art Co., Janesville 27, Wis.

8 EXPOSURE rolls 25c, over 8 exposure 40c, for one Velox print each and Free enlargement coupon. Reprints 3c, minimum 25c. Fred A. Eastman, Bode, Iowa.

SPECIAL—25 re-prints 50c: Suburban Studio, 1408-S Bond, Rockford, Illinois.

OIL coloring photographs can be a fascinating hobby or profitable sideline for those with artistic talent. Learn at home. Easy simplified method. Send for free booklet. National Photo Coloring School, 1315 Michigan, Dept. 1721, Chicago 5, Ill.

SENSATIONAL introductory offer! Send snapshot or negative, this ad, and 3c. We'll send you a beautiful 7" x 5" enlargement! Or, Kodak roll developed with 16 guaranteed deckled-edge velox fadeproof prints or 8 double-size prints, 25c! Special! From your negatives, 16 regular-size or 8 double-size reprints, 25c! Candid Rolls—36 exp. 35mm developed, vaporized, enlarged to 3x4, \$1.00! 18 exp. 50c. Reprints, 3x4, 3c each. We have new, perfect 35mm film. Low prices. Free Mailer, details on request. American Studios, Dept. 280, La Crosse, Wis.

BIGGEST \$1.00 value in 35mm finishing today. 36 exposure fine grain 3½x4½ enlargements; deckled, embossed margin and date. Eighteen exposure 75c; 16 exposure splits 55c; 36 exposure reloads 50c. Special: return this ad with \$2.00 and we will send five 36 exposure reloads. Free Mailers. 8 exposure rolls in beautiful, deckled contact finish with embossed wide margin. 25c. Mailbag Film Service, Box 5440A, Chicago 80.

TECHNIFINISH 35mm 36 exposure rolls. fine grain developed and beautifully enlarged to 3" x 4" high gloss prints only 90c; 18 exposure rolls 55c. Credit given for non-printing negatives. Reprints only 90c for 36, 55c for 18. Reprints of selected frames from uncut rolls 4c each. Reloads for your empty cartridges: 36 exposure reloads 35c, 18 exposure re-loads 20c. Fresh stock. Technifinish Color Prints 8" x 10" from your 35mm Kodachromes or 35 mm area of larger transparencies only \$3.00 indistinctive mounts; \$1.50 for additional prints from the same transparency. Black-And-White Positives from your 35mm negatives for your projector: 36 exposure positives 50c, 18 exposure 35c. Write for free mailing bag, sample print and complete information. Technifinish, Dept. 113, Rochester 3, New York.

BEAUTIFUL double size Pictures 3½c each from 116 and 120 negatives. 3½x4½ from all other sizes. All work guaranteed. Overnight service. Roll developed and 8 pictures 30c. Roll 12 pictures 45c. Roll 16 pictures 60c. Enlargements on double weight portrait paper 5x7—30c, 8x10—50c. Copies made from any picture 75c. Pacific Photo Service, Box 666, San Francisco, California.

WE have fresh films. Roll Developed coupon for six 5x7 enlargements, 16 prints—25c. Reprints 3c, 35 mm 36 3½x4½ prints—\$1.00. New film \$1.00. Dick's Photo, Louisville, Ky.

31.50 SPECIAL 35 mm 36 exposures Roll. Fine grain developed. 36 Beautiful 3x4 high gloss prints, 3 5"x7", 1 8"x10" Enlargement from 4 best negatives and 1 36 exposure Reload. Beautiful color prints from 35 mm Kodachrome. 3x4 Prints 75c. minimum order \$1.50. Brown Color Labs., Box 74, Lansing 2, Mich.

PHOTOGRAPHY for pleasure or profit. Learn at home. Practical basic training. Long established school. Write for booklet. American School of Photography, 1315 Michigan, Dept. 1721, Chicago 5.

ROLL developed, printed 20c. Reprints 50—\$1.00. Howard's, 3780 Fremont, Chicago 13.

ROLL Developed and 8 beautiful enlargements 2 to 6 times larger. Deckled Edge—High Gloss. Any 8 exposure roll 25c coin. 12 ex. 35c—16 ex. 50c—36 ex. \$1.00. Reprint Enlargements 3c each. Alden Photos, 94-4 Astor Station, Boston 23, Mass.

2 BEAUTIFUL Hi-Gloss prints each good negative and enlarging coupon with each 6 or 8 exposure roll developed 28c. Owlphoto Co., Weatherford, Oklahoma.

QUALITY Photostamps, 100 for \$2.00. Sample sent free. Herman Neely, Somerset, Kentucky.

FIFTY Genuine Photographs \$1.00! New Unusual! Send Photo or snapshot any size. You will receive 50 individual pictures gummed, size 1 ½" x 1 ½". Write name on reverse of photo. No C.O.D. orders. Grogan Photo Co., Danville, Ill.

CENTURY delivers work and service that can't be beat. 8 exp. roll 25c with two professional enlargements Free. Century Photo Service, LaCrosse, Wis.

ENLARGEMENTS Three 8 x 10 \$1.00. From same film or picture. Cosmo, 511 Grand St., Brooklyn, N. Y.

WW PLASTICS

MOLD new plastic at home. Complete instructions \$1.00. Tirekop, Box F-1, Madeira, Ohio.

FLEXI-GLAS and Lucite Kit Assortments, including cement, working drawings, instructions. 1 pound \$1.25; 6 pounds \$5.00; 25 pounds \$18.75. Masked sheets 12x12—1/8", \$2.50; 3/16", \$2.75; 1/4", \$3.00. Plexiglas rods: 24"—1/8", 8c—1/4", 15c. Lucite Rods: 23"—3/8", 40c; 1/2", 65c; 3/4", \$1.25; 1", \$2.25. Lucite tubes: 26"—1 1/2", \$2.45; 2", \$2.95; 3 1/4", \$4.75. Six ounces Plastiset fast-drying cement, \$1.00. Eight ounces red, blue, yellow, gold, green dye, \$1.00 each. Please remit with order. Add 10% to cover postage. Satisfaction guaranteed. Carmon-Bronson, 165 E. Third, Mount Vernon, N. Y.

PLASTIC Belts. New Jewel-like plastic that is a product of War Time Research. Clear, and colors. Guaranteed to outwear leather five times. All sizes up to 60" Postpaid \$1.50. Agents wanted Worthington Mfg. Co., Box 676, Brockton, Mass.

PLASTIC Cement, Dye, Sanding, Buffing, Instructions. Complete Kit. Two Dollars. No Checks. Rickys, 601 S. Vermont, Los Angeles 5, Calif.

MONEY in Plastics. Plastic Kit contains 2 lbs. Lucite Sheets Coloring Dye and Cement with instructions. Send \$2.50 to Plastic Specialty Co., 192 Lexington Ave., NYC, N. Y.

PLASTIC transparent, 3/16" thick, each piece over 90 square inches, 1/8" thick, each piece over 110 square inches. 6 pieces for \$5.00, sent prepaid. Plastic Supply Co., 2618 St. Louis Ave., St. Louis 6, Mo.

FREE! Plastic instruction booklet—included with illustrated catalog of attractive lucite gifts assembled from our pre-fabricated kits. Catalog—25c. Plastic Products Co., Box 384J, Massillon, Ohio.

LUCITE Plexiglas Kit including cement Dye Polishing Compound Instructions \$2.00 Postpaid. Homecrafters, 75 Erskine, Toronto, Canada.

ONE square foot 1/8 inch or two pound assortment \$1.00 Postpaid. The J-De-Way Co., 884 S. State, Card, Mich.

66 POULTRY & SUPPLIES

RAISE turkeys the new way, write for free information explaining how to make up to \$3000.00 in your own backyard, address National Turkey Institute, Dept. 57, Columbus, Kansas.

YOUR greatest poultry problem will look simple when you read American Poultry Journal regularly. 500,000 poultrymen do, why not you? 2 years 50c, 5 years \$1.00. American Poultry Journal, 530 South Clark, Chicago.

RAISE Poultry the Moneymaking Way. Get hidden profits. Make up to \$2500.00 in backyard. Particulars free. White Poultry Service, 155 F, Lawrence, Kansas.

POULTRY Raisers—Increase poultry profits with Experimental Farm advice. Latest tested helps. Subscribe Now! One Year 25c; Five Years \$1.00. Poultry Tribune, Dept. 20, Mount Morris, Ill.

67 PRINTING, MULTIGRAPHING, MIMEOGRAPHING, ETC.

400 5 1/2 x 8 1/2 LETTERHEADS \$1.25. Sample Free. Mango, 555-B South 20th, Newark 3, N. J.

SEND 10c Now, for our 36-page 1946 price-list—refunded first order. McCall Press, 1326 S. 27th, Omaha 5, Neb.

BUSINESS Personal Stationery. State requirements. Samples. Price List free. How Printing Co., 717-23 Eunice, Webster Groves 19, Mo.

150 8 1/2 x 11 BOND Letterheads, and 150 No. 6-1/4 Bond Envelopes, \$2.00. Westminster, Box 510-B, Evanston 3, Illinois.

350 BUSINESS cards \$1.00 postpaid. Artcraft, 40-06 97th, Corona 2, N. Y.

POPULAR SCIENCE OPPORTUNITIES

150 LETTERHEADS and envelopes \$2.00 postpaid. Going Print Shop, S-1544, Muskogee, Oklahoma.

CUTS—Make real halftones, line cuts yourself. Samples 25c. Particulars free. Radio Service, Edwardsville, Ill.

LETTERHEADS any color, 250 for \$1.95. Also other printing. Samples free. Duncan Engraving Co., Ardmore, Okla.

GUMMED Labels, stationery, etc. List free Box PS-135, Spiro, Okla.

QUALITY Printing prepaid: Business, Personal stationery, Letterheads, envelopes, statements. Prices reasonable. Samples. Mero Products, Box 344, Punxsutawney, Pa.

68 PRINTING OUTFITS & SUPPLIES

PRINT your own Postal Cards, paper, or anything on "Printomatic Self-feeding Rotary Postal Card Stencil Duplicator. Only \$9.50 with \$2.35 worth of supplies. Stencils, Ink, etc. Literature Free. Pittsburgh Typewriter Supply, 336-RE Fourth Ave., Pittsburgh 22, Pa.

PRINTING equipment, type and supplies. Send stamp for details or dime for complete illustrated supply book. Kelsey Inc X-8, Meriden, Conn.

PRINTING Presses. Type, Supplies. Lists 3c. Turnbaugh Service, Loysville, Pa.

MAKE printing press, mimeograph cuts! Entire Instructions \$1.00. Tirekop, Box B-12, Madeira, Ohio.

NEW Presses. Type, Supplies. Bulletins. 3c. Levinson, Box 918, New York 8.

INEXPENSIVE home-made printing press. Details free. Novelty Shop, Downsville, Louisiana.

PRINT At Home—Send 10c for Catalogue—Type, Presses, Supplies. Barnhard Co., 6 Columbia St., Newark 5, N. J.

69 PROFITABLE OCCUPATIONS

ANNOUNCING home study course in commercial baking. Practical basic training. Good field for those with aptitude. Nearly depression proof. Send for free booklet, "Opportunities in the Baking Industry." National Baking School, 1315 Michigan Ave., Dept. 1731, Chicago 5, Ill.

\$5000 FROM Half Acre! Growing Ginseng. Seed, contract supplied. Particulars 10c. Associated Growers, Dept. 12, St. Norbert, Manitoba.

MUSHROOMS grown; Boxes, Barrels. Instruction 50c. Spawn \$1.00. Gordons, 553 William, Winnipeg, Manitoba.

\$40.00 WEEKLY. Made growing mushrooms. Fresh, Dried. Dominion Patent 331583, free spawn. North American, 169Y Yonge, Toronto, Canada.

SHELL Jewelry, novelties. Easy to make at home as hobby or to sell. Beginners kit \$1.00. Catalog free. Burton, Dept. M-1, Box 27, Station A, St. Petersburg, Fla.

LOCKSMITHING—Profitable Business or Hobby! New course teaches you how to pick locks, fit keys, de-code, masterkey, etc. Easy self-instruction lessons. Bargain price. Fascinating 100-page illustrated catalog. Free! Write Nelson Co., Dept. 2-01, Chicago 5.

PAINTING flagpoles often pays \$50.00 daily. Particulars free. The Skyline Co., P.O. Box 1601-A, Uniontown, Pa.

START Advertising and Letter Shop. Complete low cost home training shows how. Free booklet. Pacific School, C-1, 7217 S. Broadway, Los Angeles 3, California.

PANNING Gold—Vacation Expenses—Occupation. New 160 page beginners book and three large blueprints—modern equipment \$3.00. Free literature. Old Prospector, Box 21878, Dutch Flat, Calif.

70 RADIO, SUPPLIES & INSTRUCTIONS

RADIO Service men and experimenters send stamp for our giant radio catalogue. Save dollars. United Radio Co. (1000-V), Newark 1, N. J.

BUILD Extra-Loud Crystal Set. Instructions, 20c. "All About Crystal Sets" Booklet, 45c. Amorose, Rt. 4, Hungry Rd., Richmond, Virginia.

YOUR New Free Catalog Is Ready! Radionic's Catalog lists hard-to-get radio parts and books. All available for immediate shipment. Send today to: Radionic Equipment Co., Dept. I-C, 170 Nassau St., New York 7, N. Y.

REVISED Plans 18 Crystal Sets (SW record 5300 miles), including "Radio-builder"—25c. Laboratories, Box I-T, San Carlos, Calif.

MAKE Simple, Tubeless, Batteryless, Distance-Getting Crystal Radios. Crystal and illustrated instructions 25c postpaid. Allen, 427-S, Clinton, Mo.

HEAD Phones: Latest type, light weight, finest quality, adaptable for use in making crystal sets. Slightly used sets without head bands \$1.25. With leather covered adjustable head bands \$2.50. New sets without head bands \$1.75. New sets with leather covered adjustable head bands and rubber covers \$3.75. Add 25c for mailing, send check or money order—quantity limited. Dept. B, Nico Supply Co., 540 N. 17th St., Philadelphia 30, Penna.

FAMOUS "Allen" Midget Semi-Fixed Crystal Detector, Set Building Plans and 100 late crystal set Distance Reports all for 50c. Postpaid. Allen, 427-S, Clinton, Mo.

CRYSTAL frequency control units. All kinds, including 1000 KC calibrating crystals. Also blanks. High quality. Low price. Prompt delivery. Standard Piezo Co., Box 164, Carlisle, Pa.

TELEVISION: Send 50 cents coin/stamps for complete list including diagrams for television sets RCA, GE, Dumont, Andrea. Free with order \$5.00 or more. RCA 5BP4 Cathode Ray tube, factory sealed, \$18.00. Many others. Electronics Service & Supply, 264 W. Fortieth, New York.

CRYSTAL Radio operates loudspeaker Illustrated instructions 25c. Sensitive crystals 25c. Slider-Tuners \$1.50 "Old Reliable" crystal set kit \$3.25. Radio Phone \$1.50. Aerials 75 ft. with two insulators 85c. Enamelled wire 25c per coil. Crystal and tube diagram 25c. "World's Simplest 1-tube" diagrams 25c. Catalog free. Huilet, 334B E. 39th, New York.

NO license required to operate new phono-oscillator. Transmits recording, voice 500 ft. Simple instructions. Complete kit with tubes \$7.95. Super-Sensitive All-Wave Receiver. Complete kit with tubes, simple instructions \$10.75. Send for free catalog. Electronics, 6942 Myrtle Ave., Glendale, N. Y.

RADIO service flat rate schedules solve pricing problems. Compiled from 20 years experience. Write for information. Radio Equipment Co., 1415 W. Franklin Ave., Minneapolis 5, Minn.

OSCILLOSCOPES. 5 inch BC 412 A.C. opr. 115 volts from Government Radar scr 268, Western Electric manufactured; cost Government approximately \$500; Special Price \$44.50 with 13 Tubes. Radar SCR 268 components Western Electric manufactured BC409 Keyers, cost government \$1.000, complete for \$59.50; BC407A high powered Oscillator 5KW with 16 tubes 205 megacycles \$99.00; rectifier high voltage supply 15,000 volts, 500 mills DC-110V. Operation \$499.00; BC435 Modulation unit \$99.00; BC436B Range unit \$29.00; detailed information on request. Receivers, BC 406S with 15 Tubes including 6 acomes from Radar scr 268 Super-Het, 115 A.C. approximately 203-207 Meg. easily adapted to all VHF use. Western Electric Mfd., Price \$39.50. Emerson built new short wave Receivers, 4 band, 4 position 2-8 Meg. with 7 Tubes, portable, powered by 2-volt battery, value \$100 for \$37.00. Cathode Ray Tubes 5 BP1 (Sylvania) tested \$12.50. Head phones HS33 high impedance, 2000 ohms D.C. res. light weight \$1.75. Microphones, lip-button (Signal Corps) 75c; throat type 50c. Telegraph Keys \$1.15. 1 MFD, 1000 V.W.G.E. Pyranol 95c; 2 MFD, \$1.65; 8 MFD, 600 VW \$1.85; 10 MFD, \$1.95. 1 MFD, 6000 VW (Westinghouse) \$9.25. Coaxial Cable 10c foot. One 500 Watt Transmitter mfd. Federal Telephone & Telegraph Co. 500 Watts CW grid modulation 50 watt phone; Price \$1150. All prices F.O.B. New York City. 25% deposit. Crating and shipping charges added. Send for our Free weekly flyers. World Wide Communications Equipment, 350 Pearl St., Brooklyn, N. Y. 88 Cortland St., N. Y. C.

TEN. Simple, Easy to build Crystal Radio diagrams and crystal 25c Postpaid. Potter, 1314 McGee, Kansas City 6, Mo.

FAMOUS Razor Blade Radio! Illustrated Plans 35c. New Radio, Lohrville, Iowa.

ELECTRONIC problems? Ask for free circular. Radionic Laboratory, 413 Amsterdam, New York, N. Y.

BUILD Your Own Two Tube Walkie-Talkie. Low Cost. Plans \$1.00. Electronic Devices: 942 Market, San Francisco, Calif.

BUILD Your Own Radio. Simple Instructions. All kits complete including tubes. 4 tube T.R.F.—\$10.75. 5 tube Superhetrodyne—\$17.95. National Radio Distributors, 140-P W. 42nd St., N. Y. 18, N. Y.

AMAZING Pocket Tester Test AC-DC circuits, Fuses, Motors, Radius Ignition with instructions 50c. Radio Tubes wholesale, Retail. World Sales, Box 81, Clifton, N. J.

POCKET Radio! Build vest pocket radio for local and long distance reception. Listen while walking or working. Attractive. Unique. Plans and photo \$1.00. United Manuf. Associates, P.O. 6163, Dallas, Texas.

NEW FM-Television Radio Courses Starting January. Engineering, Box 291, Dallas, Texas.

BE a Radio Broadcast Engineer. New, easy course. Details. Electronic Engineering Institute, Albuquerque, N. M.

75 RUBBER STAMPS

SELF-INKING Pocket Stamps—2 lines \$1.00; 3 lines \$1.25. Dater 50c. Postpaid. Circular free. Press, Warm Springs 1, Georgia.

RUBBER stamps, all kinds. Send for Catalog. Excello Sales, Box 500, Shreveport, Louisiana.

THREE lines 65c Lee-Vall Press, Box 1242, Indianapolis 6, Indiana.

77 SONGWRITERS

POEMS Wanted. To be set to music. Send your song poem today for free examination by our staff headed by nationally famous hit composer of "Dream A Little Dream of Me". Our new 6 step plan is most liberal and complete ever offered. Write today for free booklet. Screenland Recorders, Dept. PS, Hollywood 28, Calif.

SONGWRITERS: Collaborate with nationally famous composer of "Boots and Saddles". Send poems for free examination. Get Free instructive booklet. Hollywood Harmony House, 126 S. La Brea, Studio L-11, Los Angeles, Calif.

SONG Poems Wanted, for musical settings. Send poems for Free Examination. Write for Free Instructive Booklet outlining Opportunities. United Music Corporation, Salem 18, Indiana.

POEMS Wanted to be set to music. Free examination. Send poems. McNeil, Master of Music, 510-PS S. Alexandria, Los Angeles, California.

SONGWRITERS. Songs Published Monthly. Advance Royalty. Send your songs or poems today for our exciting offer. Hollywood Tunesmiths, Dept. 10F-C, 1537 N. Vine, Hollywood 28, Calif.

POEMS Wanted for Musical Setting. Send poem for immediate consideration. Five Star Music Masters, 646 Beacon Building, Boston.

SONGWRITERS—Send Poems for immediate examination and Free Book, "Your Future in Songwriting". Radio City Music Academy, 1674 Broadway, New York 19.

SONGWRITERS. A limited amount of musical compositions wanted for radio distribution. Tin Pan Alley Publications, 1587 Broadway, New York 19, N. Y.

NEW songs and lyrics wanted for Popular Radio Programs and professional promotion. Free examination. Transradio Music Inc., Dept. P.S., 1650 Broadway, N. Y.

SONGWRITERS! Amazing, ethical offer. Hibbler, C15, 2157 N. Avers, Chicago.

SONG poems wanted—All subjects. Send your best poems today for free examination, or write for free booklet "Getting Ahead in Songwriting", Song Service, 331-J West 46th, New York.

POPULAR SCIENCE OPPORTUNITIES

POEMS wanted for immediate musical setting. Free examination; any subject. Well known music publisher in urgent need of original material. Send poems to: Composer's Guild of America, 545 Fifth Ave., New York 17, N. Y.

SONG writers: \$100 cash award monthly for best song poem. Melodies supplied without charge by recognized Hollywood composers. Lead sheets and records furnished. Cinema Song Co., Box 670-B30, Beverly Hills, Calif.

WANTED! Lyrics, melodies for songs. We arrange, publish, sell. Superior Song Studios, Passaic, N. J.

SONG Writer's Attention! The amazing demand for phonograph records, accelerated by more than 300,000 Juke Boxes and the Hits accredited them warrants your immediate consideration. We are offering song-poem writers the rare opportunity of having established composers collaborate on appealing material received this month. Recola Records, Box 987S, Hollywood 28, Calif.

"LEARN to write music, words, arrangements and publishing. The Complete Songwriter tells How. Send \$2.00 M.O. postpaid to Puritan Publishing Co., Inc., 334 S. Dearborn St., Chicago 4, Ill.

POEMS Wanted! I'll compose special music. Send poem for Free examination. Eliot Wright, Box 3861-Y, Portland, Ore.

AE SOUVENIRS

COLLECT Japanese and German Flags, and Military Emblems souvenirs, from overseas. Details, sample emblem, 15c. Hobbyguild, S-35 W. 32nd St., N. Y.

8 PHOTOGRAPHS taken on Kwajalein during Marshalls invasion, \$1.00. Ed Bazemore, 313 Tremont, Chattanooga 5, Tenn.

78 SPORTING GOODS, GUNS, FISHING TACKLE, ARCHERY

BOWS-Arrows for Recreation-Hunting-Fishing. Beautiful Archery instruction book, 70 pages, 50 illustrations, only 50c. Illustrated catalogue free. Archery Sales-Service, 617 South State, Chicago.

USED Guns, Binoculars. Bought Last opportunity to get good prices before new merchandise comes in. Also Sold and Traded. Stoeger Arms Corp., 507 5th Ave., New York 17, N. Y.

SEND 10c for list 100 used guns. Frayseths, Wilmar, Minnesota.

USED GUNS, bought, sold, exchanged. List stamp. Howe, Coopers Mills, Maine.

2000 BARGAINS, firearms, binoculars, war relics, catalog 30c. Smith Museum, Rutherford, N. J.

FISHERMEN! Land those big ones with new Spearhead hooks. Double barb on a curved point, slices on shank keep bait on hook. Ask your dealer or send 25c in coin for sample packet Spearhead hooks. Spearhead Fishhook Co., 7303 Woodlawn Ave., Dept. PS, Seattle, Washington.

80 STAMP COLLECTING

ROOSEVELT Special—2 two-cent covers, with handcolored photo of Little White House; 8x10 portrait, reprint local paper of his death with poems, \$1.00. Press, Warm Springs 1, Ga.

ZOWIE-E-E! A Barrel of Fun for only a Dime! 500 United States—Absolutely unpicked and unsorted—just as received from church missions. Many varieties, including large commemoratives airmails, high denominations up to \$5.00! Stampdom's biggest package of fun—and you might find something really valuable!! Price only 10c to serious approval service applicants. Money back if not delighted. Illustrated bargain lists with each order. Mystic Stamp Company, Department 56, Camden, New York.

WORLD'S Largest Diamond And Triangle Stamps, Free Stamp Magazine. Stamps from Fighting Free French. 20 stamps from 20 different Countries. Pictorials. Airmails. Big Bargain 5c with approvals. Capital Stamps, Dept. 10, Little Rock, Ark.

WANTED—Collections and Accumulations. Prompt payment. Richard Groman, 306P, East Hamilton, Allentown, Penna.

BRITISH Empire! 55 Different including Batum, Burma, Cyprus, Gwalior, Tasmania, 5c to Approval Buyers. Lyman, 97 Nassau St., New York 7.

FREE—Canadian Sets. Royal Visit, George VI, George V, Coronation, Jubilee, others, to approval applicants. Ensign, Box 118-P, So. Orange, N. J.

SPECIAL—Airmails—19 different, including Zeppelin, Triangles, Latin America, etc. 5c with approvals. Continental Stamp Co., Box 606, Dept. C, New Rochelle, New York.

118 DIFFERENT stamps including commemoratives, charities, airmail, sets, etc. Only 3c to approval buyers. We buy collections. Badger Stamp Co., Milwaukee 3, Wisconsin.

SCARCE 1880 U. S.—Hussey Local Carrier Stamp listed at 15c. Also Costa Rica No. 65 listed at 40c. Both sent free to approval buyers sending 3c postage. Pladon Stamps, 1717-S Idaho, Toledo 5, Ohio.

COMPLETE "United States" catalog with 1000 illustrations! Send 10c for mailing. Harris & Co., 99 Transit Bldg., Boston, Mass.

UNITED STATES approvals complete coverage fine quality, attractive prices. Seminole Stamps, Box 436, Coconut Grove, Florida.

DEALER'S Wholesale Catalog. Postage 3c. Franksco, 5031 Queensberry, Baltimore, Maryland.

SCARCE "Pole To Pole" Packet! Stamps from strange, mysterious countries only—Greenland (North Pole!), Solomons, Spanish Morocco, Bhopal, Patiala, Siberia, Grahamland (South Pole!), Djibouti, Zanzibar, etc., and including stamps cataloging up to 25c each! Our Price only 5c to approval applicants. Big Dime Packet List free! Methuen Stamp Service, Inc., Dept. 146, Lawrence, Mass.

WOW! \$10.00 Worth Of Fun Only 10c. What a treasure hunt! Big package 500 Foreign Stamps—just as received from foreign missions other sources. Includes stamps from Africa, South America, Philippines, Dutch Indies, Cape Juby, Palestine, etc., including airmails, commemoratives, and stamps worth up to 50c and 75c. This amazing offer is given for 10c to serious approval applicants only. One to a customer, money back if not more than delighted. Jamestown Stamp Co., Dept. 5, Jamestown, New York. Stamps—Valued Up to 50c And 75c Each.

1000 MIXED U. S. none better 30c lists. Weatherby, Medina, Ohio.

BOX Stamps containing hundreds all different cataloging up to 25c each. Everything \$1.00. Longacre Shop, 106 W. 42nd, N. Y.

FIFTY Canadian Newfoundland, including earlies, commemoratives 10c approvals. Reade, 696 Gerrard, Toronto.

FREE! The Stamp Finder! Send today for big new edition, fully illustrated, enabling you instantly to identify all difficult stamps! Also fine packet strange, fascinating stamps from Bosnia-Herzegovina, Monaco, Patiala, Cyprus, etc., including maps, ships, animals and strange scenes. All free to approval applicants inclosing 3c postage. Garcelon Stamp Co., Box 918, Calais, Maine.

FINE Approvals, freshly mounted. Fast, personal service. Tell me what countries you prefer and I'll send their stamps. Milton Skinner, 345 East Ocean, Long Beach 2, Calif.

114 DIFFERENT stamps from far away countries including Airmail and Free Fighting French to approval applicants for 10c. Reich Stamp Co., 4647 Kenmore, Chicago 40, Dept. S9.

FREE! Pony Express set (facsimiles). Postage 3c Roberts, 401 Shearer Bldg., Baycity, Mich.

FREE!!! British Empire Packet. Postage 3c. Williams, 601 Archer Bldg., Baycity, Mich.

FREE! Western Hemisphere Packet. Postage 3c. Owens, 801 Welsh Bldg., Baycity, Mich.

PACKET Scarce United States before 1910. Only 10c to approval applicants. E. J. Banks, 6635-16S Ave., Kenosha, Wis.

UNITED STATES on Approval. Largest varieties. Americas lowest selling prices. Fort Orange Stamps, Albany 7, New York.

UNITED STATES Collection—fifty different mint unhinged commemoratives 1893-1939 only \$2.00 to approval applicants. Stamp Co., Albany 7, New York.

PENNY Approvals that satisfy. Neil Gronberg, Box 5441S, Philadelphia 43, Pennsylvania.

EXCELLENT Pictorial approvals. Reasonably priced. Crown Stamp Co., Box 331, Toronto, Canada.

POSITIVELY Greatest Free Offer—Latest Scott's International \$5.00 Stamp Album covering entire World, contains 36,000 illustrated, descriptive spaces; Scott's 1946 Standard \$5.00 Catalogues "Philately's Encyclopedia"—absolutely Free to applicants for Foreign Approvals becoming customers. Bargain Stamp Service, Palm Springs, California.

125 ALL different U. S. \$1.00. Old, new issues—Comms.—Postage—Dues—Famous Americans—Airmails, etc. Good condition. Lightly cancelled. Guaranteed to please. Try our foreign packets 10c each, 3 for 25c, 14 packets \$1.00. All different. Bargain. Approvals sent on request. Armour Stamp Co., St. Albans, N. Y.

ATTRACTIVE Approvals for Beginners, advanced collectors. Jacobsen, 59 Nagle Ave., New York 34, N. Y.

60 DIFFERENT United States, 10c. Price-list free. Seidenberg, Cassopolis, Mich.

GERMAN Hitler Stamps. Brought over by American soldiers in small quantities as souvenirs. These stamps are bound to be very scarce because all remainders have been burned by Allied Governments. The most unique items in any collection. We will send two values, mint, one regular size and one large size, both for only 10c to sincere approval applicants. Please state whether approvals should consist of United States or foreign or both. Approval Headquarters, Globus Stamp Co., 268 4th Ave., New York City, Dept. 217.

FREE—Tannou Touva "Teddybear" Triangle, Reunion, Uganda, Tanganyika, old American Colony; including "Stork" stamp, War Refugees, others, all Free with approvals for 3c postage. Dominion Stamp Co., Arlington, Va.

FREE! Complete Balkan aviation set with approvals. Beaman, Glenburnie 10, Maryland.

ARMY Navy set 10c foreign—United States approvals. Yokum's, Box 1327, San Antonio 6, Texas.

FREE! Tiny Chinese "Midget" War set. Approvals. Seminole, Glenburnie 10, Md.

1945 REVIEWED in our 517 different suggestive Values, and even U.S. Coast Guard First Day Cover, cataloguing \$10.75 to new approval applicants \$1.00. Intercity Co., Dept. Y, Port Washington, N. Y.

50 DIFFERENT including scarce diamond-shaped airmail 3c to approval service applicants. Avalon Stamp Co., Dept. S, Springfield 8, Mass.

RICH Man's approvals, poor man's prices. Grand value packet containing five mint sets. Free with approvals. Stoll Stamp Service, 2632 W. Burnett, Louisville 10, Ky.

50 FREE, pictorial etc., stamp dictionary, list. Bullard, Newcastle, Me.

U. S. Commemoratives—75 different, 25c. Crystal Stamp Co., Racine, Wis.

25 DIFFERENT Canadian, 5c to serious approval applicants. All priced approvals. Moderne Stamp Co., 2037 Ames St., Los Angeles 27, Calif.

HEADACHE cure European War Issues "Sensible Low Prices" Lists Free! Treasure Chest 5024 Crystal, Chicago 51.

EXOTIC Pictorial collection: Tahiti spear-fishing, Melanesian idol, Carib archer, Columbo harbor, Reunion produce, Yugoslavia, Philippines, Porto Rico, Malagasy farm, Dutch Indies, South Africa Roman's charity, Martinique settlement, Newfoundland codfish, Djibouti locomotive, Victoria. Everything only 5c Imperial Stamp Co., Yonkers 1, N. Y.

MISSION Mixtures—Foreign, \$1.00 pound, U. S., 50c. Stamps, Box 64, Racine, Wis.

POPULAR SCIENCE OPPORTUNITIES

BECHUANALAND Protectorate, gorgeous Tonga, exotic Pitcairn Isle, beauteous French Colonies—Everything 3c with approvals! Saxon Co., Walden, New York.

MAGAZINE—Chock-full stamp information, news and bargain ads! 15 issues 25c! "Stamp Post", Station A, Pasadena, Calif.

FREE—25 different Japanese pictorials and Commemoratives to approval applicants. Charles Cleaveland, 806 N. Humphrey, Oak Park, Ill.

TRIANGLES and diamond shaped stamps only! Beautiful assortment six different, 10c with approvals. Saylor Stamp Company, 2073½-B Hillhurst, Los Angeles 27, Calif.

30 BEAUTIFUL Airmails 10c; Selected Approvals. Louis Morrison, Milmont Park, Pa.

77 DIFFERENT World—5c. Approvals. Utechts, 1143 D. N. Keller, Chicago 51.

CHINA 25. Different plus 5 Different Straits Settlements all 10c. Hayek, 1580 E. 19 Street, Brooklyn 30, N. Y.

FREE! Leeward Is., Cayman Is., Turks and Caicos plus 54 different mint World's Fair poster stamps, to approval service applicants sending 3c postage. Tatham Stamp Co., Springfield 50, Mass.

FIVE Beautiful pictorials Curacao, Suriname 5c to approval applicants. Miami Beach Stamp Co., Box 2068, Miami Beach (40) Fla.

LIBERIAN Triangulars, Set 10c with approvals. Vargo Stamps, 6044 S. Fairfield, Chicago 29, Ill.

NEW Zealand Semipostal Triangle Set (15c value) only 6c with approvals. George Richie, 368 Josephine, Memphis, Tenn.

14 WEST Indies, 3c approvals. Super Stamp Shop, 2 S. Madison, Greencastle, Ind.

FREE Over 100 Different Stamps—Triangle and Diamond Stamps included, with approvals. Send 5c for postage and handling. Regent, Dept. S, 316 Flatbush Ave., Brooklyn, N. Y.

PITCAIRN Mutiny Islands. Pirate Map, Thailand, Ukraine, Mauritania, Ottoman, Hatay, Tobago, etc. with Camel, Kiwi, etc. All free for 3c postage. Approvals. Star Stamp Co., 206 E. Terrace Ave., Lakewood, N. Y.

75 COUNTRIES! Packet containing stamps from 75 countries to approval applicants sending 10c for mailing expenses. Quality Stamp Co., Dept. S, Box 202, Station F, Buffalo, N. Y.

1,000 GRABBAGS, 15c each. Special Bags 25c. Sandy, 630 Bingaman, Reading, Pennsylvania.

10 DIFFERENT U. S. Over 40 Years Old, Sc. Foreign, U. S. approvals. Scott, 30 Baker Ave., Lexington 7, Mass.

FOREIGN approvals for beginners. 1c and up. M. W. Payne, W. Cheshire, Conn.

20 DIFFERENT Mexico—3c with approvals. Premiums with purchases. Brandwein Stamp Co., Box 92P, Bayonne, N. J.

UNITED States and Foreign stamps sent on approval outstanding quality, low prices. Fred Herzberg, PS 168 Oak St., Elmhurst, Ill.

\$1.00, \$5.00 U. S. Postage Dues—3c with approvals. Riffles, 211 Jefferson, York, Pa.

CARBURETOR repair kits for most popular cars and tractors. Free lists. Carburetor Service, 600-B LaPrairie, Ferndale 20, Mich.

CANADA War set 10 var. 10c with interesting approvals. Rheaume, 8949 Routhier, Montreal 12, Canada.

5 HITLER Stamps only 3c, with Approvals. Gaydos, Kenosha, Wis.

FREE—Pick 25c worth of stamps from our first U.S. Approval Selection . . . Approximately 100 stamps to choose from . . . Excellent value . . . No obligation to buy. Lists illustrating the most popular U.S. stamps—at prices you can afford—will be included. Don't miss this opportunity! Write today. S. D. Engel Co., 38 Park Row, New York City.

19th CENTURY U. S. Commem. Civil War Battleship revenues, \$5 and \$10. Stamps free to U.S. approval applicants. Metropolitan Stamps, 198 G. Broadway, New York.

PENNY approvals that please. McKee, 848 Banklick St., Covington, Ky.

FIFTY British Colonies Free to Approval Applicants. Pelican Stampco, 1809 S. W. 8th St., Miami, Florida.

GRAHAM Land, South Georgia, South Orkneys, South Shetlands, Falkland Islands Dependencies. Stamp from each Dependency with approvals 10c. Collins', 71 Coleridge St., San Francisco 10, Calif.

\$1.00, \$2.00, \$5.00 U. S. stamps Free to approval applicants. Riverside Stampco, Box 1565, Miami 35, Fla.

BEAUTIFUL Pictorial Approvals. Low Prices—Getche, 1040 N.E. Eighteenth, Minneapolis 13.

25 DIFFERENT Guatemala 10c with ¼-½-1c Approvals. Carroll's, 4357 C S. Hoover, Los Angeles 37, California.

300 DIFFERENT given free with approvals. Postage 3c. Windsor Stamps, 1435 E. 67th Place, Chicago 37.

U. S. and Foreign approval Departments. Return Postage paid. Atwater, P. O. Box 15838, Miami 35, Fla.

17 NEW Issues. This Startling Collection includes Airmails and Commemoratives. The Cost? Only 10c with approvals. Stamp Collector's Service, Box 325, New York 8.

FREE! World Wide Packet. Approvals. Eagleco, 2439 S. Fifth, Phila. 48, Pa.

SUPERB Packet Collection! Each contains all different stamps. 400 Argentina, \$6.50; 100 Australia, \$3.50; 500 Austria, \$10.00; 350 Belgium, \$5.00; 200 Brazil, \$4.00; 50 Ceylon, 2.50; 200 China, \$6.50; 100 Czechoslovakia, \$1.00; 200 Denmark, \$7.00; 200 Ecuador, \$5.00; 100 Estonia, \$7.50; 250 France, \$6.00; 100 Great Britain, \$2.00; 200 Greece, \$7.50; 50 Iraq, \$1.75; 300 Yugoslavia, \$7.50; 100 Liberia, \$7.50; 300 Mexico, \$12.00; 100 New Zealand, \$4.00; 200 Peru, \$7.75; 200 Poland, \$4.00; 300 Russia, \$8.50; 200 Sweden, \$6.50; 200 Switzerland, \$5.00; 300 Turkey, \$6.00; 150 Uruguay, \$1.75; Satisfaction Guaranteed. W. L. Bedford, 3420 Montclair, Detroit 14, Mich.

37 DIFFERENT Leewards, Iceland, Triangle, Thailand, Morocco, Arctic, others—all 5c. Approvals. Kipp, Laanna, Penna.

SCRIBBLE a line—United States approvals, right price, real nice. Jarr, Box 217, Madison Square Sta., New York 10.

PENNY Approvals by country. M. H. Hoerning, 102, Farmington, Arkansas.

FREE—18 Different Switzerland with approvals. Excel Stamp Service, Box 1315, Chicago 90.

FREE packet with attractive approvals that satisfy. Postage 3c. C. P. Field, Kennett Square, Pa.

CEYLON Set 3c Attractive Approvals. Johnstone, 18 Crest, Springfield 9m, Mass.

U. S.—60 Diff. Commemoratives, Etc. 3c. Approvals. Moseley, 4515a Lacled, St. Louis 8, Mo.

MISSION Mixture. 500 Stamps 25c. Garrow, 851 W. 177th, New York 33.

SMOKY Mountain commemorative sheet. largest U. S. stamp issued, and 33 U. S. including commemoratives, airmail revenues, etc. Catalogs 75c—To approval applicants for 5c. Curhan Stamp Company, Dept. C, Gloucester, Mass.

1000 WELL mixed U. S. 25c. Monjar, 1750 Fairmount, Cincinnati, Ohio.

TRIANGLES—(Mozambique Co.) other beauties, 10c. Approvals. Reuter, 811-D W. 40th, Los Angeles 37.

U. S. APPROVALS? Thousand Books for Inspection—Box 488A, Minneapolis.

NOTICE—Readers answering ads offering Approvals receive a selection of stamps from which they may make purchases at prices indicated. Ten days are allowed for payment and return of undesired stamps. Otherwise, approval applicants become subject to Section 2350, Postal Laws & Regulations, 1932, providing penalties for obtaining property by false pretense.

82 TATTOOING SUPPLIES

DIAMOND Point Engraving Outfits, for Jewelry, Tools and Freehand Engraving. Also Tattoo Supplies and Equipment. Send for Free literature. Wm. Moore Mfg. Co., Inc., 651 S. State St., Chicago, Ill.

83 TAXIDERMY

FINEST Glass Eyes; Taxidermy Supplies. Catalog Free. Elwood Supply Co., Dept. 235, Omaha, Nebr.

84 TOBACCO—PIPES

CIGARETTES: \$1.13 per carton. Details 15c. Box 294, Herkimer, N. Y.

50 MILD Cigars Prepaid \$3.15, \$4, \$5.50 Continental Cigars, Corning, New York.

K TRAPPING

TRAP Fox and Coyote—On bare ground or deep snow. Learn modern tricks to outwit the sly furbearers. Free illustrated circular. Q. Bunch, Welch 1, Minn.

BB TREASURE FINDERS

MT-SCOPE Metal Locator fully guaranteed and unsurpassed in efficiency. Time payment plan, trade-in and accessories. Free literature. Fisher Research Laboratory, Palo Alto, Calif.

86 TYPEWRITERS

USED Typewriters, Mimeograph, Multigraph Printing Devices, supplies, Dixie-Graph, King, N. Carolina.

J VOCATIONAL GUIDANCE

DISCOVER your best abilities through scientific aptitude tests. Information 10c. Testing Service, 507-SJ Gas-Electric Bldg., Rockford, Illinois.

"**JUDY** Page, Medical Technologist". A Novel. Ideal Gift for Young Girl seeking interesting profession. \$2.50. William-Frederick Press, 313 W. 35 St., N. Y.

VOCATIONAL Guidance—Be sure you've chosen the right career. Latest methods. Five dollars brings tests, Guidance Center, 526 Park, Hastings, Mich.

87 WANTED MISCELLANEOUS

MERCURY—Highest prices. Free Containers. Write Mercury Terminal, Norwood, Mass.

If you want to Swap Buy or Sell Anything, send 25c for The National Swappers Guide. It's chock full of Swappers, Sellers, and Buyers from coast to coast and opportunities to Swap, Buy, and Sell almost anything under the sun. National Swappers Guide, 610 St. Joseph, Evansville 12, Ind.

N WATCHES

WATCH and clock repairing—complete practical course in modern horology. 66 illustrated self-instruction lessons. Just out! Low price. Fascinating 100-page illustrated catalog Free! Write—Nelson Co., Dept. 8-01, Chicago 5.

BIG Money in Watchmaking, repairs, adjustment. Learn this profitable trade at home. New, complete "Practical Course" for beginners, professionals, fully illustrated, only \$2.95 postpaid. Money back guarantee. Tools, materials supplied. Modern Technical Book Co., Dept. 2MS, 55 W. 42nd St., New York 18.

WATCH and clock repairing increasing, complete home study course with drawings and pictures. Information free. Houston Chronomatic and Watch Co., P.O. Box 5367B Houston 12, Texas.

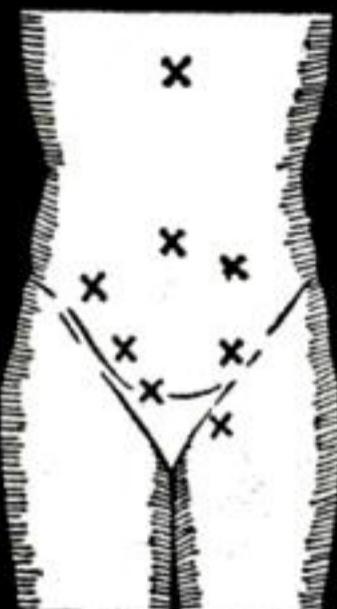
GUARANTEED watch and clock repairing. 8-day service. Mail yours to. Rite-Time, 1318 W. 95th St., Dept. 2, Chicago, Illinois.

88 WELDING, SOLDERING

BUILD D.C. Arcwelder without rewinding armature. Plans \$1.00 each. 25 to 600 amperes from automotive d.c. motors, light plant generators. Automobile starter-generators. Welders Club WB-3432, Chicago 54.

NEW Model electric welder 110 volt AC-DC; will weld all metals; easy to use, full directions. Complete with power unit, flame and metallic arc attachments, carbons, fluxes, rods, mask; all for \$19.95—Used by the Navy. Magic Welder Mfg. Co., 239-PS-1 Canal St., New York City.

Quick help for Rupture!



Where's YOUR Rupture?

PROOF!

Read These Reports on Reducible Rupture Cases

(In our files at Marshall, Michigan, we have over 44,000 grateful letters which have come to us entirely unsolicited and without any sort of payment.)

Never Loses a Day's Work in Shipyard

"A few weeks ago I received the Appliance you made for me. Wouldn't do without it now. My fellow workers notice how much better I can do my work and get around over these ships—and believe me, the work in a Navy shipyard is anything but easy. I never lose a day's work now."—J. A. Comer, 1505 Green Ave., Orange, Texas.

Perfect Relief—Full Satisfaction

"Your truss gives FULL SATISFACTION. I feel it my moral duty to testify to the world:—(A)—That I have been ruptured 45 years. (B)—was operated on scientifically ten years ago when 76 years of age; but the rupture returned soon. Have tried everything; but only now do I find PERFECT RELIEF in your appliance."—Lee R. Stroud, 601 E. Grove St., Kaufman, Texas.



C. E. BROOKS,
Inventor

SENT ON TRIAL!

No . . . don't order a Brooks now . . . FIRST get the complete, revealing explanation of this world-famous rupture invention. THEN decide whether you want to try for the comfort—the wonderful degree of freedom—the security—the blessed relief that thousands of men, women and children have reported. They found our invention the answer to their prayers! And you risk NOTHING in making the TEST, as the complete appliance is SENT ON TRIAL. Surely you owe it to yourself to investigate this no-risk trial. Send for the facts—now—today—hurry! All correspondence strictly confidential.

**FREE! Latest Rupture Book Explains All!
JUST CLIP and SEND COUPON** 

Brooks Appliance Co., 360-A State St., Marshall, Mich.

Rupture!

Why put up with days . . . months . . . YEARS of discomfort, worry and fear—if we can provide you with the support you want and need? Learn NOW about this perfected truss-invention for most forms of reducible rupture. Surely you keenly desire . . . you eagerly CRAVE to enjoy most of life's activities and pleasures once again. To work . . . to play . . . to live . . . to love . . . with the haunting Fear of Rupture lessened in your thoughts! Literally thousands of Rupture sufferers have entered this *Kingdom of Paradise Regained* . . . have worn our support without the slightest inconvenience. Perhaps we can do as much for you. Some wise man said, "Nothing is impossible in this world"—and it is true, for where other trusses have failed is where we have had our greatest success in many cases! Even doctors—thousands of them—have ordered for themselves and their patients. Unless your case is absolutely hopeless, do not despair. The coupon below brings our Free Rupture Book in plain envelope. Send the coupon now.

Patented AIR-CUSHION Support Gives Wonderful Protection

Think of it! Here's a surprising yet simple-acting invention that helps Nature support the weakened muscles gently but securely, day and night. Thousands of grateful letters express heartfelt thanks for relief from pain and worry,—results beyond the expectations of the writers. What is this invention—how does it work? Will it help me? Get the complete, fascinating facts on the Brooks Air-Cushion Appliance—send now for free Rupture Book.

Cheap—Sanitary—Comfortable

Rich or poor—ANYONE can afford to buy this remarkable, LOW-PRICED rupture invention! But look out for imitations and counterfeits. The Genuine Brooks Air-Cushion truss is never sold in stores or by agents. Your Brooks is made up after your order is received, to fit your particular case. You buy direct at the low "maker-to-user" price. The perfected Brooks is sanitary, lightweight, inconspicuous. Has no hard pads to gouge painfully into the flesh, no stiff, punishing springs, no metal girdle to rust or corrode. It is GUARANTEED to bring you heavenly comfort and security or it costs NOTHING. The Air-Cushion works in its own unique way—softly, silently doing its part in providing protection. Learn what this patented invention may mean to you—send the coupon quick!

MAIL THIS COUPON NOW!

BROOKS APPLIANCE CO.
360-A State St., Marshall, Mich.

Without obligation, please send your FREE BOOK on Rupture, PROOF of Results, and TRIAL OFFER—all in plain envelope.

Name

Street

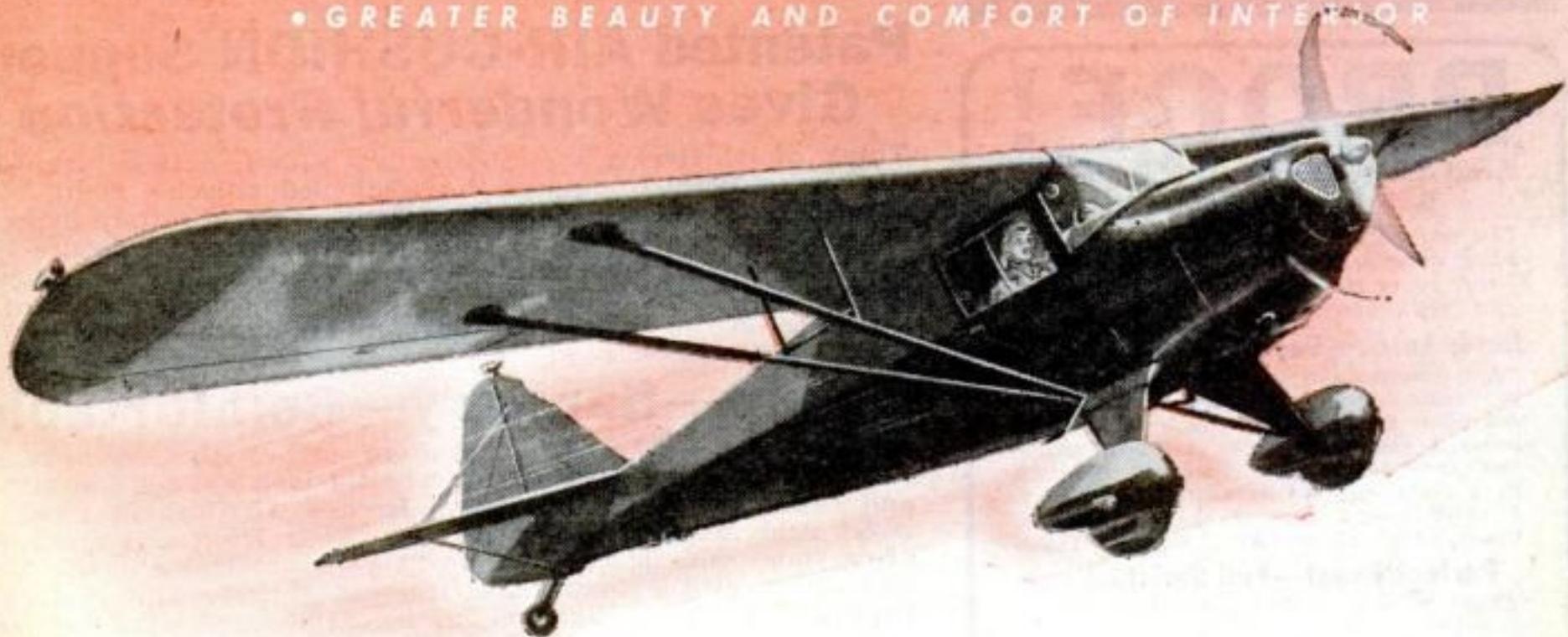
City..... State.....

State whether for Man Woman or Child

BEST BUY IN THE SKY!

TAYLORCRAFT

- **GREATER AIRABILITY** — Taylorcraft is time-tested, sky-bred and sky-proved! Will outperform any ship in its class—in Speed, Altitude and Endurance.
- **GREATER SPEED PER HP** — Greater Speed range from low to high than any other light plane in its class. Lowest, safe landing speed—fast smooth cruising speed.
- **MORE PROVEN SAFETY** — Here is precision control which permits the pilot to exercise his own ability and judgment rather than rely on mechanical controls which permit no freedom of action in emergencies.
- **BETTER CONSTRUCTION** — Of 6500 Taylorcrafts built in the past ten years, not one has been found to have a structural failure. PROOF CAA records!
- **LOWER OPERATING COST** — War training school operators have proved Taylorcraft costs less to maintain than any other plane in any class at any price!
- **SWIFTER TAKE-OFF** — Taylorcrafts will operate out of the smallest fields. Landing roll is only 300 feet! Best high altitude take-off performance.
- **MORE ALL-AROUND PERFORMANCE PER HP—and HP costs money!**
- **GREATER BEAUTY AND COMFORT OF INTERIOR**



• No wonder the thousands who own and have owned Safe T'Crafts over the past 10 years are so intensely loyal! All who see and fly the new Taylorcrafts agree—Dollar for Dollar—Feature for Feature—Taylorcraft has earned the reputation

"BEST BUY IN THE SKY"



VICTORY! Because you weren't here to place an advance order for your favorite personal plane, we at Taylorcraft have reserved 25% of our entire production for your needs. Just show your discharge papers—and go to the head of the line.

Write: TAYLORCRAFT AVIATION, Dept. B, Alliance, Ohio

Taylorcraft

World's Largest Builders of Two and Four Passenger side-by-side Airplanes



TAYLORCRAFT IS TAKING ORDERS AND DELIVERING PLANES TODAY

JAN. 1946

POPULAR SCIENCE

MONTHLY



You Can't Smash Science With Sledges!

(A Statement by the Editor of Popular Science Monthly)

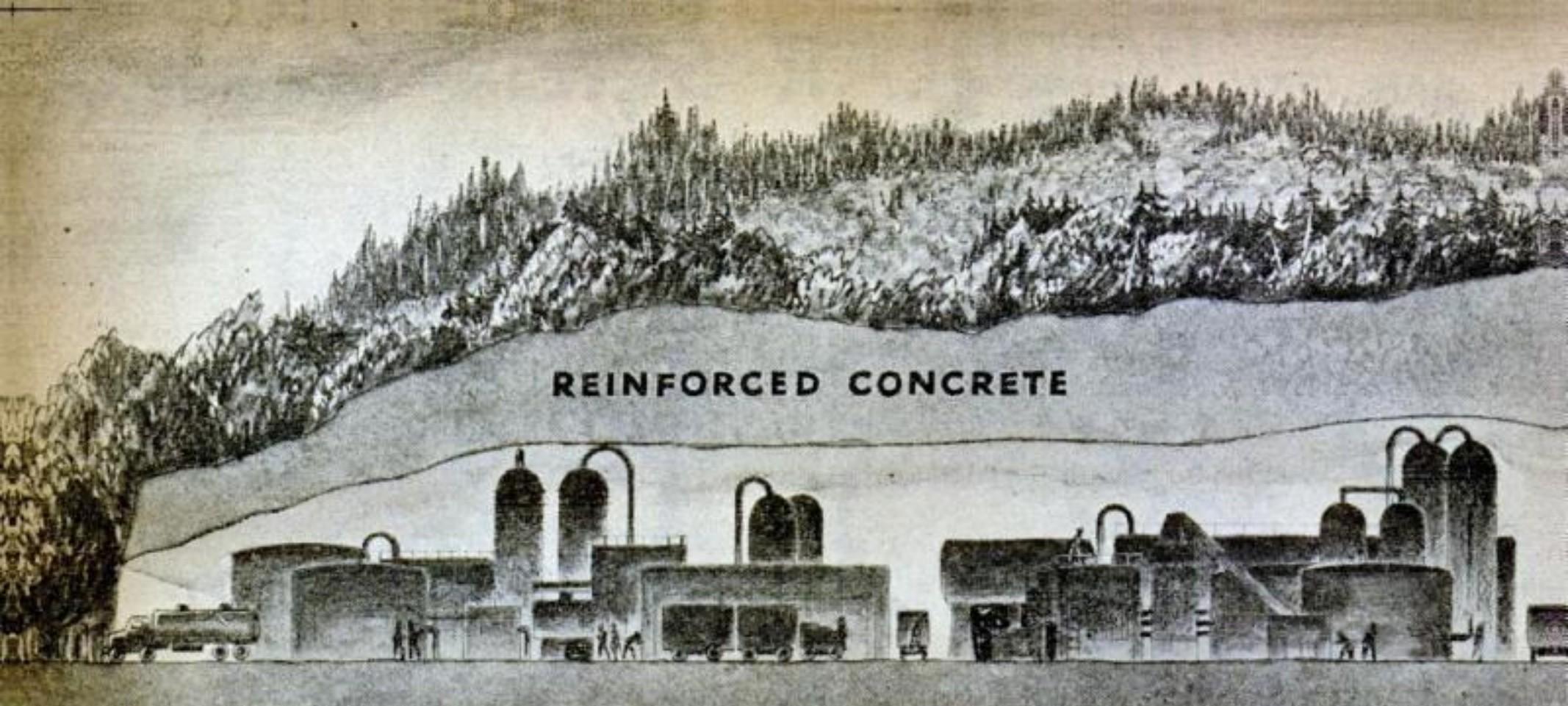
So THE cyclotrons of Japan have been smashed. We can rest easier in our beds if not in our minds. We can evade, for another night, our fears—and our frightening responsibilities. But a sledge and a block of TNT are small solace and no final solution to either. For "thought police," in any uniform, cannot handcuff the human mind.

Such mere vaults of knowledge as the razed libraries of Alexandria and Louvain, or the burned books of Berlin, may be destroyed again. But science as truth, science as the human thrust from the unknown dark into the light of knowledge, cannot be destroyed unless man himself is destroyed. Ultimately, science is something more than "an orderly approach to a problem." Science is that human hunger to know which distinguishes thinking man

from the blind beast and the savage retreating to the cave of his own fears.

The protests of aroused scientists could not stop the destruction in Japan. But there must be no more sledge-hammer thinking in America. To destroy a cyclotron, or an electron microscope, or a rack of germ cultures—in any country—is to destroy the tools of science. It is to put out men's eyes, maim their groping hands. Certainly, the world needs more, not less, scientific thinking. But even the greatest scientific ideas are impotent until implemented and proved and projected with the machines of science.

The scientists, who have freed men from the shackles of space and time and matter, can lead man to that knowledge of himself which he needs to live in dignity—and to survive.—PERRY GITHENS.



REINFORCED CONCRETE

Underground lubricating plants were being built in Germany when it fell, but they were begun too late.

RISE AND FALL OF

Why Air Blows That Smashed Synthetic Oil Industry

By VOLTA TORREY

"The German experience suggests that even a first-class military power . . . cannot live long under full-scale and free exploitation of air weapons over the heart of its territory."—Report of United States Strategic Bombing Survey.

NAZI Germany was a chemical empire that rose swiftly, fell suddenly. Its history has been written now by scientists. Civilian chemists and engineers of the U. S. Strategic Bombing Survey have unraveled

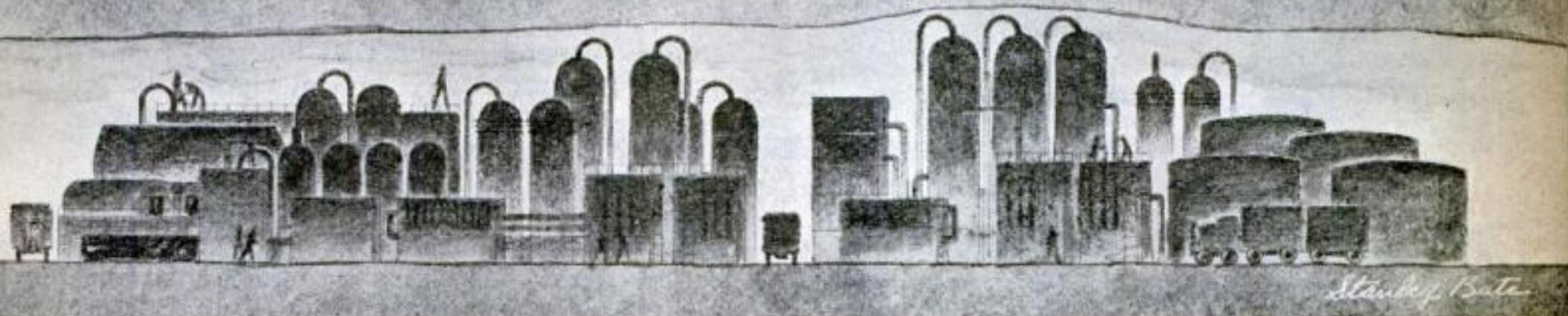
this unprecedented empire's inside story from secret German records, interviews with German authorities, and extensive surveys of the bombed-out plants and laboratories of the Reich's oil, chemical, rubber, and explosives industries.

These industries were the basis of Hitler's power. They produced the fuel for his warplanes, U-boats, tanks, and V weapons. They supplied substitutes for the hundreds of natural products which the British blockade kept him from obtaining elsewhere. By producing innumerable items, mainly from coal, air, and water, these industries enabled

Germans hid small distillation units in the woods, like Kentucky moonshiners' stills, to elude bombers.



REINFORCED CONCRETE



Nazis planned to produce 92,000 tons of aviation fuel, quantities of other products, deep in the earth.

A CHEMICAL EMPIRE

Caused Mighty Nazi War Machine to Grind to a Halt

the Nazis to blitz and defy much richer nations.

Unlike America, Germany had very little natural petroleum. When Hitler invaded Poland in 1939, he had on hand only enough aviation gasoline to fight for about three months, and only enough automotive gasoline and nitrogen for explosives to last about two months. New fields discovered near Vienna during the war yielded more crude oil, and additional supplies and refineries were stolen from other countries. Even so, more than four-fifths of the Nazis' gasoline, 99 percent of their rubber, and all of the nitric acid used in their explosives came from Germany's plentiful supplies of coal.

Friedrich Bergius, a Nobel Prize winner, found a way in 1920 to make liquid oil molecules by splitting the complex molecules of coal and forcing hydrogen into them. Since the hydrogen had to be used under pressures up to 10,000 pounds per square inch and at high temperatures, building the compressors used in Bergius plants was a task comparable to manufacturing naval guns. Fifteen times as much steel was required for synthetic oil plants as for ordinary refineries, and the Germans devoted as much steel to the construction of such plants between 1937 and 1944 as would have been needed to build a battle fleet four times the size of the U. S. Navy in 1940.

Another prewar development, the Fischer-Tropsch process, enabled the Germans to take molecules of carbon monoxide and hy-

drogen from coal and build up various oil molecules. The products obtained by this synthesis had special properties, for which many chemical uses were found. But the more complicated Bergius method was used more extensively, because it was the only one by which great quantities of aviation gasoline could be produced.

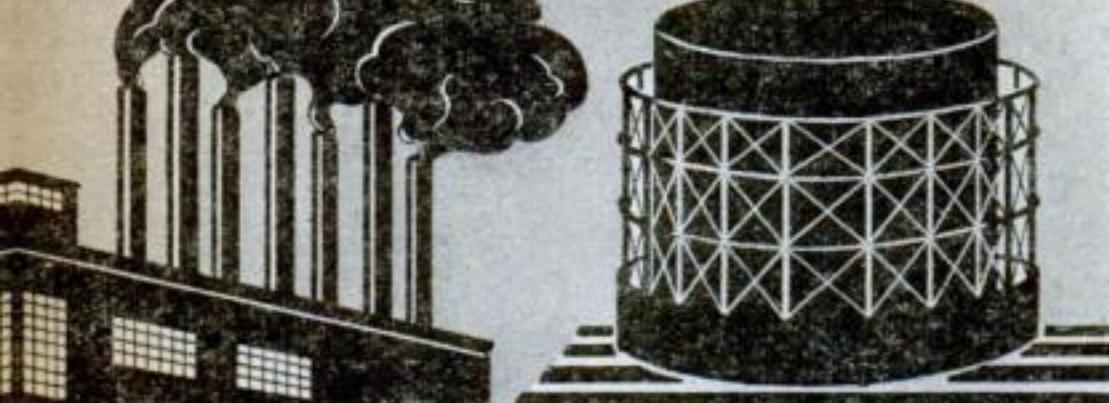
Both processes were expensive; gasoline produced synthetically cost from four to five times as much as gasoline obtained from crude oil. The coal needed to make enough gasoline to fill the wing tanks of a Flying Fortress would heat an average-sized home in New York all winter, and an average-sized German synthetic oil plant consumed more electricity than an American city of 250,000.

Regardless of the cost, the Nazis set out long before the war to make themselves independent of other nations. Powder and explosives plants, which had been trimmed down to reasonable proportions by the Treaty of Versailles, were expanded with the help of a state-owned corporation created secretly in 1932. Synthetic rubber production was increased nearly 2000 percent in three years. And the production of synthetic liquid fuels was encouraged by slapping a tariff of 30 cents a gallon on gasoline in 1937, and by lending money and guaranteeing prices to the chemical and coal concerns.

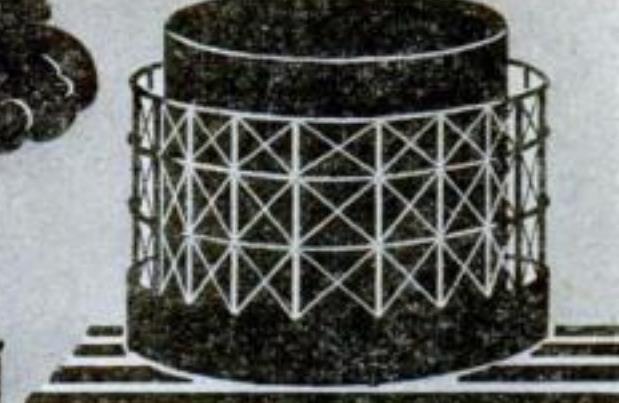
Germany's well-developed chemical industry, with 12,000 qualified chemists on its payrolls in 1937, had grown up in the Ruhr,



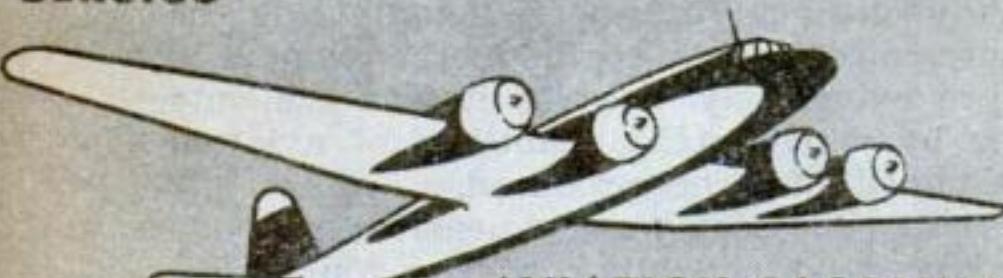
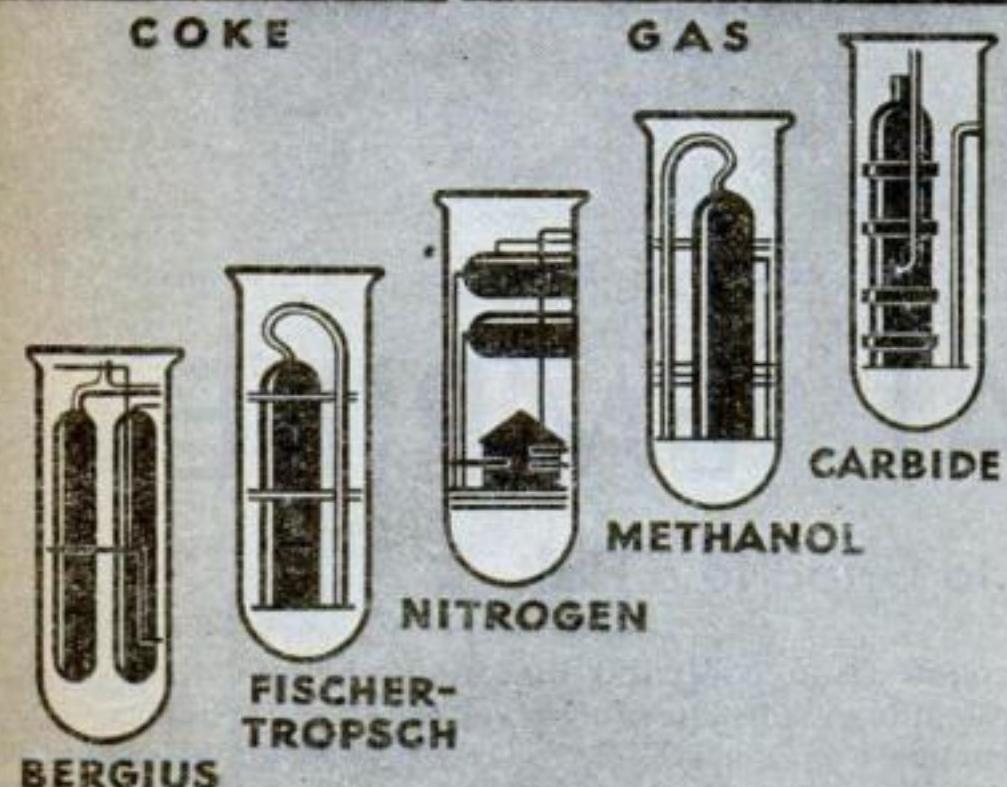
COAL



COKE



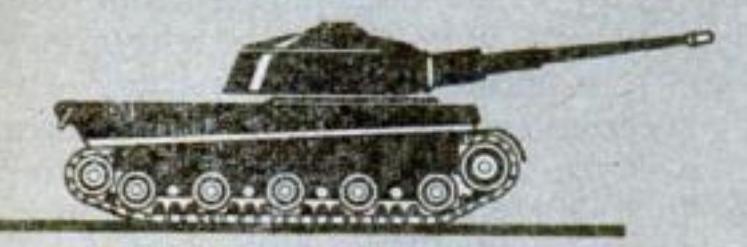
GAS



AVIATION GASOLINE



MUNITIONS



DIESEL FUEL



RUBBER TIRES

along the Rhine and in Central Germany, in or adjacent to the coal fields. The I. G. Farbenindustrie held the patent rights to the Bergius process and Ruhrchemie had the rights to the Fischer-Tropsch process. The old plants of these and other firms were expanded, and new plants were erected in the same areas. Thus, the oil, chemical, rubber, explosives, and other industries of the Reich were interlocked not only by their mutual dependence on coal but also historically, geographically, and mechanically.

The gigantic chemical empire that rose under Hitler's regime is described, in fact, as an "octopus" in the official report of the Oil Division of the Strategic Bombing Survey. Its body was the gas-generating plants, and its arms were the many plants that used those gases to produce a long list of chemical products.

This octopus continued to grow, despite many small aerial attacks, until the spring of 1944, when it became the target of an intensive, strategic bombing campaign by both the RAF and the 8th Air Force. It was well defended. Huge, reinforced concrete "dog houses," and brick blast walls shielded the vital parts of the plants; and bombardiers often were deceived by decoy plants—which had wooden platforms built to simulate the appearance of oil tanks, and fireworks that could be set off to make observers think that real plants were being bombed.

The bombs used against the synthetic oil targets in the first big strategic attacks were too small. People were killed, pipe-bridges, utility lines, and sewers were damaged, and operations were halted, but the plants recuperated quickly. The first aerial attacks, in other words, merely damaged some of the arms of the octopus. But later, as bigger bombs were developed and hurled against these targets, the gas-producing facilities which were the heart of the whole group of industries were hit and shattered.

Nazi authorities saw what was coming a year before the war ended. The Plans Division of the German Air Force reported in 1944 that "the greatest danger lies in the threat to the fuel supply," and Albert Speer, Reichminister for Armaments and War Production, confidentially warned Hitler that "if the attacks on the chemical industries continue . . . those very materials essential for continuation of modern warfare will be unavailable in the most important fields."

Edmund Geilenberg, a former miner who had worked his way up to be manager of

Most of Germany's aviation and car fuels, all its nitric acid, vast stores of chemical materials for rubber, other vital products, were synthesized from coal.

the Brunswick Steel Works, was made General Commissioner for Immediate Measures. These measures included the swift, energetic repairing of bombed-out plants and steps to disperse oil production facilities and move plants underground. Geilenberg was told by Hitler to tackle the work "with a generous supply of manpower and material and reckless energy."

Exactly one year after he was given almost unlimited authority, American occupation forces found Geilenberg repairing bicycles. At one time, however, he had commanded a labor force of 350,000 persons, and the speed with which his crews repaired the damaged plants made it necessary for the airmen to attack oil targets time and time again.

The most grandiose of the Nazi plans to save their chemical industries were those which called for hiding small plants in the woods throughout Germany, where they would be as invisible from the air as the stills of Kentucky moonshiners, and moving enough additional plants underground to keep the Luftwaffe in the air.

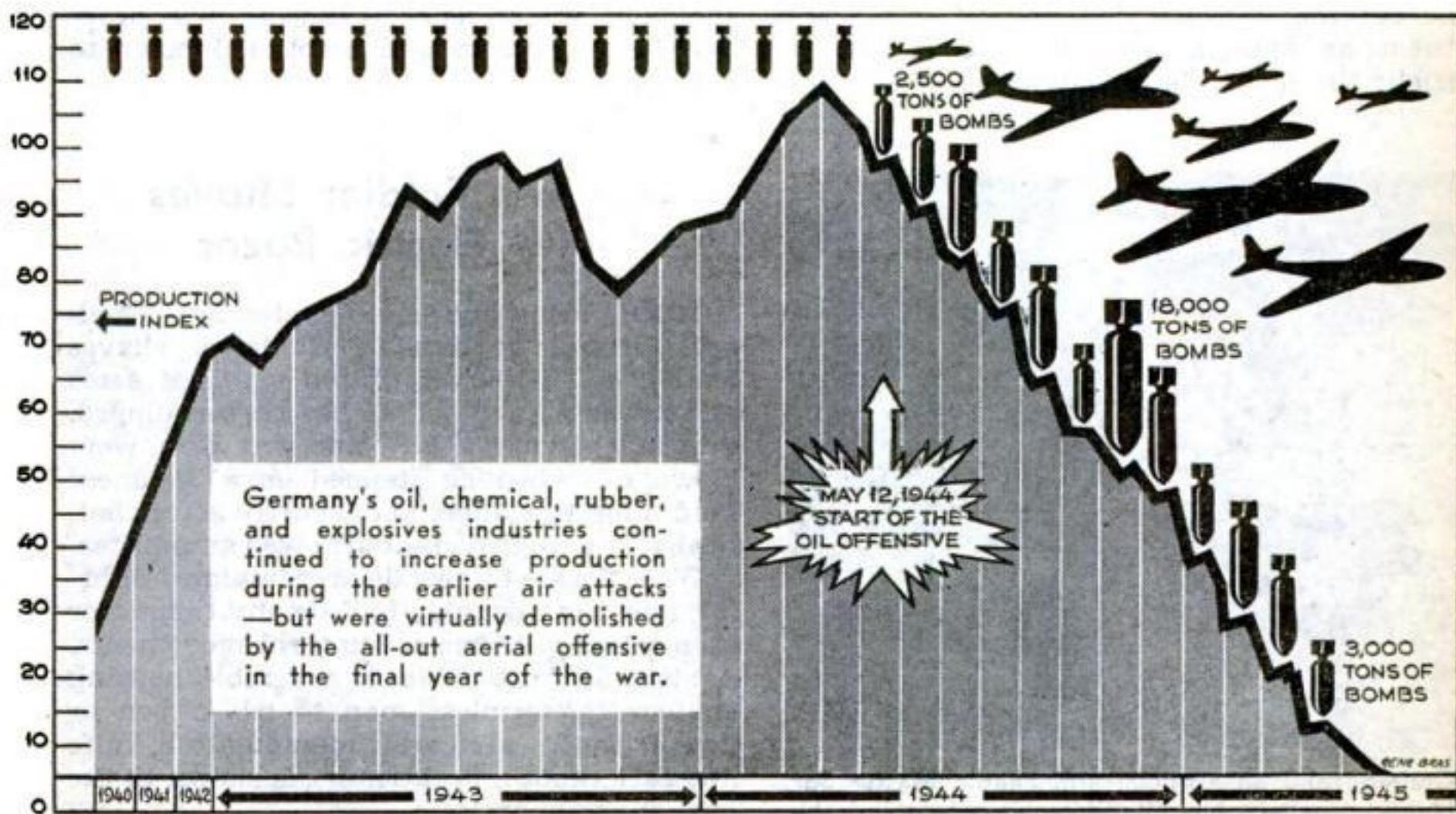
In the opinion of the Strategic Bombing Survey's experts, the idea of moving fuel production underground was feasible. Properly designed and ventilated oil plants could be operated underground with reasonable safety. But the Germans' underground and dispersal program was never completed. It would have required a full year's labor by at least 200,000 men, more than were employed in the whole oil-refining industry of the United States in 1944, and the Americans and Russians closed in on the Nazis

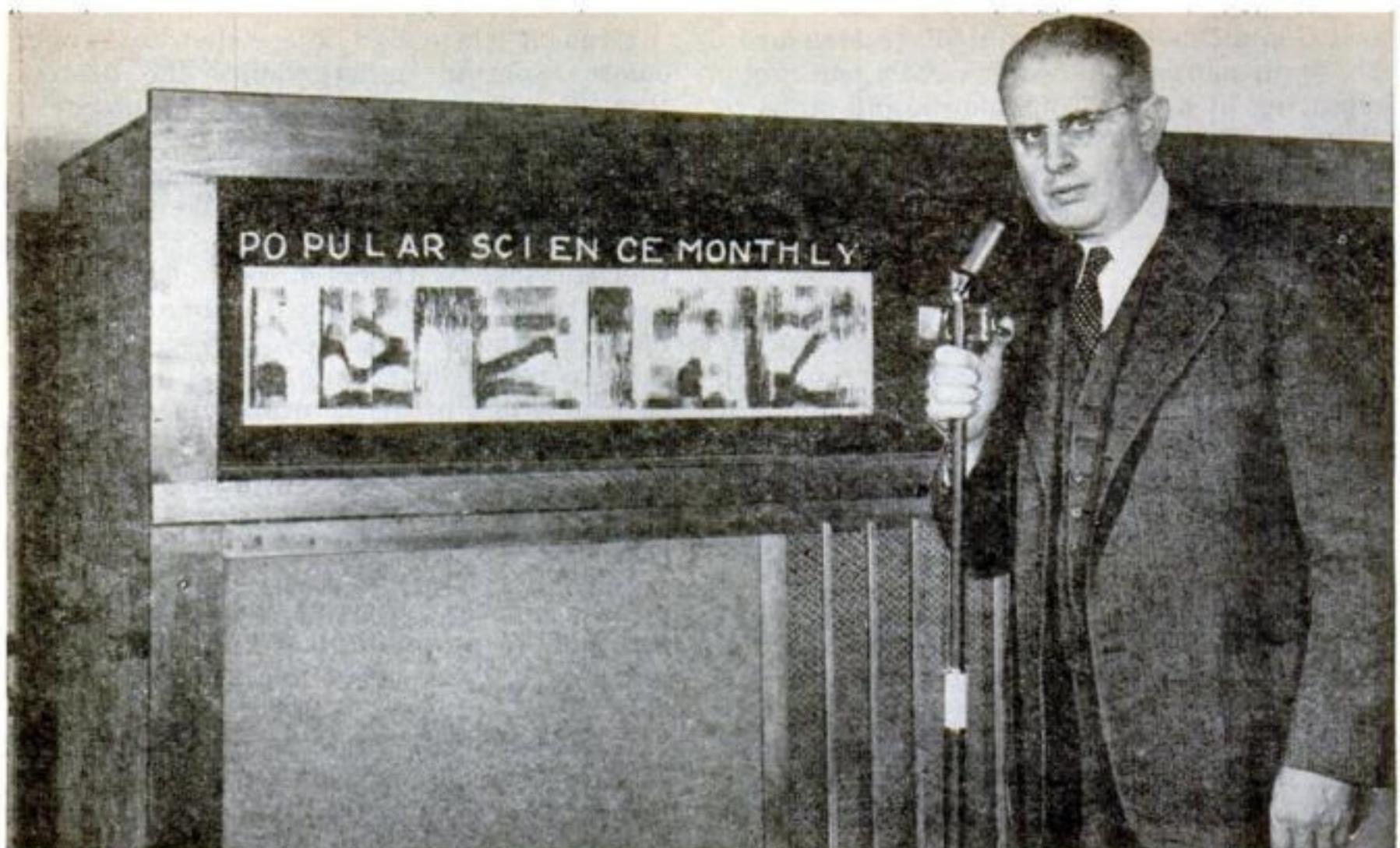
too fast for them to prolong the war this way.

Even if they had succeeded in moving colossal plants underground, the destruction of railroads and sources of power on the surface would have made the plants of little value. Lack of storage space would have kept them from running at full capacity without adequate, regular, transportation service. With no more steel than was used to repair damaged surface plants, however, the Germans could have run pipelines to refineries from oil fields and extended a network of distribution pipes throughout Germany. They might then have been able to supply their armed forces with a respectable quantity of oil products despite the strategic bombing.

Instead, aviation gasoline became so scarce that the Luftwaffe had to stop training pilots in September 1944. Men with only 40 to 45 hours of flight training were sent into combat, countless planes were lost because of the pilots' inexperience, and hundreds of planes were grounded.

Automotive gasoline became so scarce that the speed limit was set at 17 miles an hour and every trip of more than 60 miles had to be approved by a commanding general. Although 1,200 German tanks were massed against the Russians at the Baranow bridgehead in 1945, the Germans had only enough fuel to refill the tanks two or three times. On other occasions, tanks and armored vehicles were moved to the front by oxen. Gas generators which made it possible to use coal or wood as fuel were put on 100,000 vehicles a year before the war ended and (*Continued on page 210*)





The Deaf Can "Hear" by "Reading" Pictures of Sound

SPOKEN words are turned into readable patterns for the deaf on a machine developed at the Bell Telephone Laboratories. Spoken into a microphone, words are electrically translated into strange patterns on a screen that flashes by, much as are the news bulletins on an electric sign. Sound has three dimensions—pitch, loudness, and time—all of which affect the patterns moving slowly across the screen. The trained eye reads them as speech. Dialects are shown as such; the device is not stumped even when

the word "curve" is uttered as "coive."

The apparatus also enables a deaf person to improve his enunciation, which, because he cannot hear the finer shadings in his own voice, usually is a dull monotone. If his pronunciation of a word does not flash a pattern that compares with one recorded by a voice teacher, he may correct his delivery until he is able to adjust it to a normal speaking voice. Then, after a little practice he is able to add emotional color to his speech.



Courage and an artificial arm enable Master Sgt. Hensel to shave himself, while his wife stands by.

Armless Soldier Shaves with Electric Razor

MINUS arms and legs, Master Sgt. Fredric Hensel, veteran of Okinawa, shaves handily with the aid of the artificial arms and hooks with which he has been equipped. Sergeant Hensel's legs and left arm were blown off when he stepped on a Japanese land mine last June, and, shortly after that, his badly mangled right arm was amputated.

With the aid of new devices, maimed fighting men are now able to do many things for themselves with almost natural movements. A steel aircraft cable in a flexible housing enables the armless man to use a pen or pencil, handle a cigarette, manipulate a knife and fork, knot a necktie, or, as shown to the left, shave himself.

"RAWIN" SPIES ON THE WEATHER

New radiosonde apparatus aided wartime flying



BALLOON "scouts" in the stratosphere helped keep U. S. Army and Navy planes flying during the war in all but the foulest weather conditions. One reason why missions were accomplished in anything less than a typhoon or a black fog was that service meteorologists knew more about the weather than ever before. For the past three years they have been aided in their remarkable long-range, long-distance forecasts by a "weather sleuth" that gathered clues on winds, temperatures, and pressures from the upper atmosphere and solved the mystery of what was going to happen climatically.

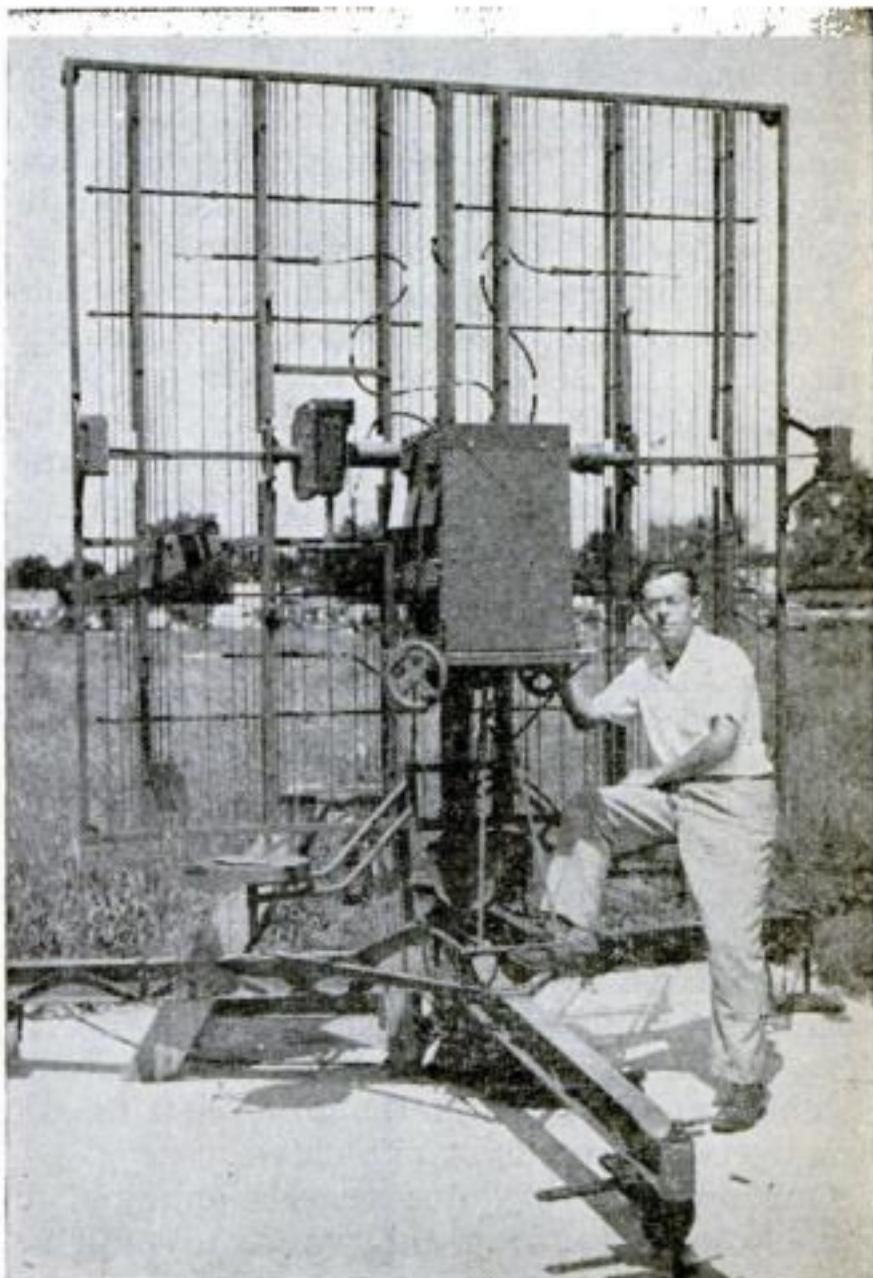
This wartime refinement of the well-known radiosonde, like its ancestor apparatus (P.S.M., Nov. '43, p. 90), consists of a balloon-borne radio transmitter and a recorder unit. Its technical name is SCR-658, and it was developed by the Army Signal Corps and engineers of the Farnsworth Television & Radio Corporation.

SCR-658 makes possible more accurate observation and tracking of the high-flying balloon unit, in this case called the Rawin (Radio Wind) detector. The apparatus includes a radarlike direction finder on the ground that "sees" the detector and follows its upward course accurately through fog, clouds, and darkness.

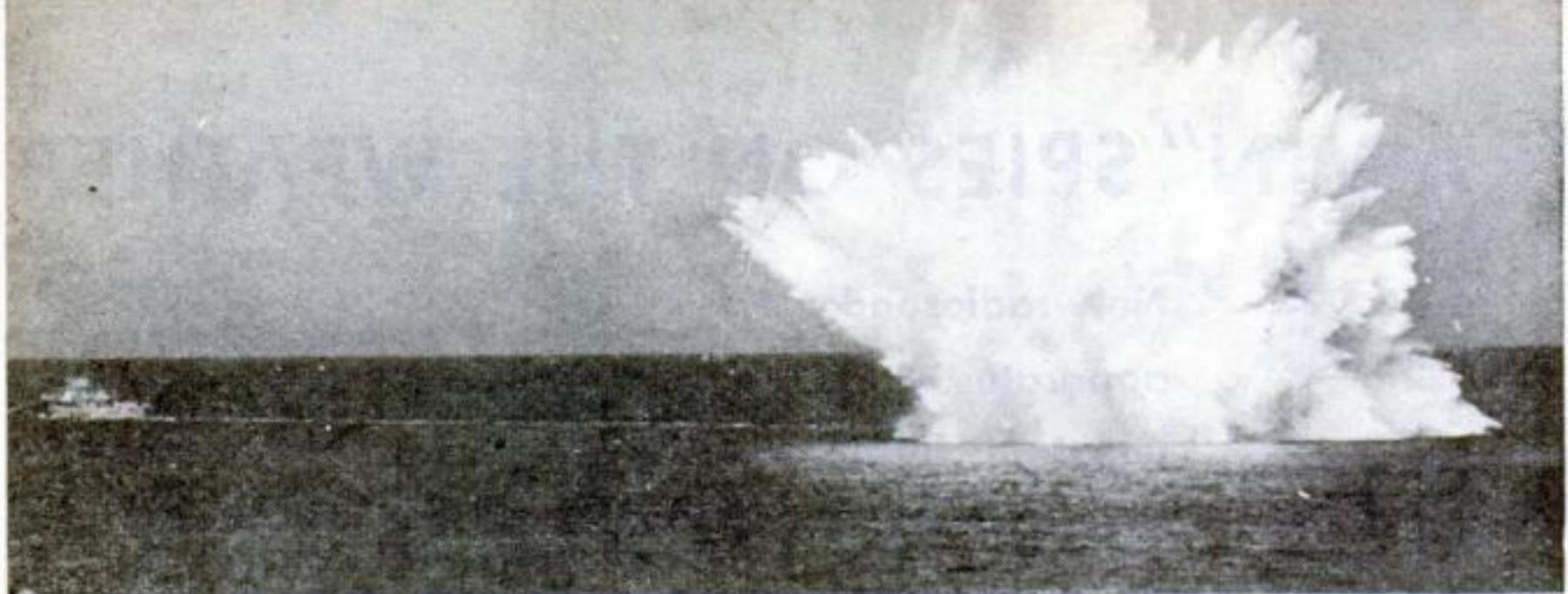
The Rawin detector's 3½-pound, battery-operated, AM-FM radio transmits signals at 397 megacycles as it climbs and as it gently descends, by paper parachute, after the hydrogen-filled balloon has burst in the thin air of altitudes over 60,000 feet. The

signals are picked up by the SCR-658's direction finder. Its operator adjusts the antenna with hand-wheel controls to keep the drifting, rising balloon centered in his cathode-ray scope. He can read at a glance the correct azimuth and elevation indications. A recorder, frequently situated in the weather office, as much as 500 feet away, is connected to the direction finder's receiver. It "decodes" the AM and FM radio signals and traces patterns on a graph that indicate the changing air temperature, humidity, and height of the balloon. Since altitude is expressed in terms of barometric pressure, the observers can readily obtain any pressure data they need.

Weather Bureau officials are said to be considering the operation of SCR-658 equipment in U. S., as an aid to commercial aviation, maritime industries, and to farmers.



DIRECTION FINDER "sees" balloon climb into stratosphere; it has a radarlike scope in box unit.



Pulling another mine's teeth—10,000 such menaces have been accounted for by fleet of 600 U. S. sweepers.

THEIR WAR IS NOT OVER

U. S. Navy's sturdy little minesweepers doggedly fight on in hard Pacific campaign against both Jap mines and ours.

By DEVON FRANCIS

Photographs by U. S. NAVY

FOR some men in the U. S. Navy, V-J Day was just another date on the calendar. Their war will go on for another two years, maybe longer, because they are assigned to sweeping murky ocean water clear of mines.

During six years of war, tens of thousands of explosive containers were sown in the waters of the Seven Seas, by both the Axis and the United Nations, to tear open the hulls of enemy ships and send them to the bottom. To make peacetime commerce safe, these "fields" of mines must be decontaminated. The western Atlantic is cleared and the British and Russians are clearing the eastern Atlantic. Fortunately, our Navy has only the Pacific's waters to worry about—but the Pacific is the world's biggest ocean.

Sweeping mines is a hard, dangerous job. It is like feeling for a needle in a haystack. Even with the help of meticulous reports from the Japanese as to where they sowed mines, a flotilla of sweepers is never sure when a prow will crush the soft "horn" of a contact mine, or trigger the sinister mechanism of a magnetic mine, setting off hundreds of pounds of explosive.

One out of every five vessels engaged in minesweeping during the war was sunk or seriously damaged. Some were struck by shore fire—the minesweepers always paced the assault in an amphibious operation—and some went down under air attack.

Holiday Cargo, Crew Safe As Ship Hits Japanese Mine

By The Associated Press.

PEARL HARBOR, Nov. 17—The U. S. S. Bridge, carrying 102,000 pounds of Christmas and Thanksgiving turkey to Navy personnel in Korea and China, struck a Japanese mine off Japan and was disabled, the Navy announced today.

The crew and the cargo were transferred safely to the U. S. S. Marin. The Bridge was pumped out and towed to an unannounced port.

Mines, however, continued to sink sweepers after the battles ended, and without differentiating between friends and enemies.

A mine is as deceptive as Baby Face Nelson. It is easy to sow, but pulling its teeth is something else again. When German submarines were attacking convoys off Key West, Fla., in 1942, the U. S. laid 3,460 defensive mines at that rendezvous point for shipping, but only 1,663 were found in 1944 when the field was ordered decontaminated. Four of those missing mines had sunk four Allied ships. Others undoubtedly had gone off unobserved and some had sunk into the mud of the ocean floor to become so en-

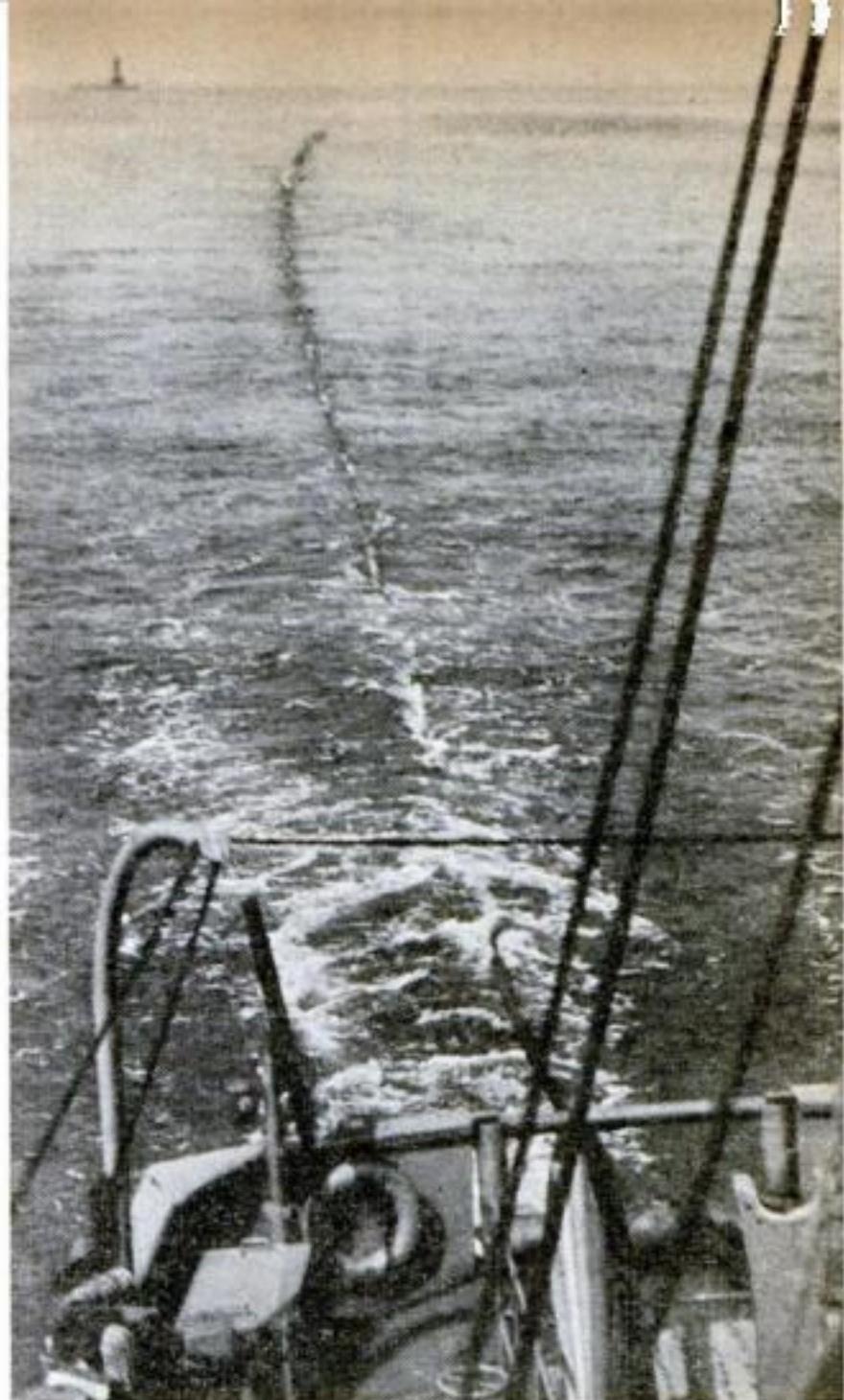
crusted with barnacles that nothing would set them off. Mines are so hard to find and detonate, once laid, that the United States turned down a project for sowing a "barrier" mine field 100 miles at sea off the entire Atlantic coast, even when German submarines were picking off our ships like sitting ducks.

In World War I the famous North Sea mine barrage, numbering more than 70,000, bottled up the entire German navy, submarines included. In World War II a barrier of mines from Iceland to the Norwegian coast threw such fear into U-boat skippers that, the story goes, they broke out a bottle of champagne whenever they managed to nose through it safely.

Minesweeping is dirty with danger because sweepers never know what these outside booby traps are going to do next, or how they can outguess them. Mine warfare is a day-to-day battle of cunning and inventiveness between the men who design mines and those who try to keep them harmless.

The Germans led in mine designing throughout most of World War II. They introduced the magnetic mine, set off by the magnetic field of a metal ship. No sooner had the Allies whipped this weapon by "degaussing" their ships—decreasing their magnetic fields—and by exploding such mines with wooden sweepers trailing "tails" of magnetic cable, than the Germans put out an acoustic mine. Mere noise would set it off, and ships make a lot of underwater noise. Warships, cargo ships, and sweepers met this challenge by reducing speed and projecting a bedlam of noise in front of them. For a time, ordinary air hammers beating on steel plate served the purpose.

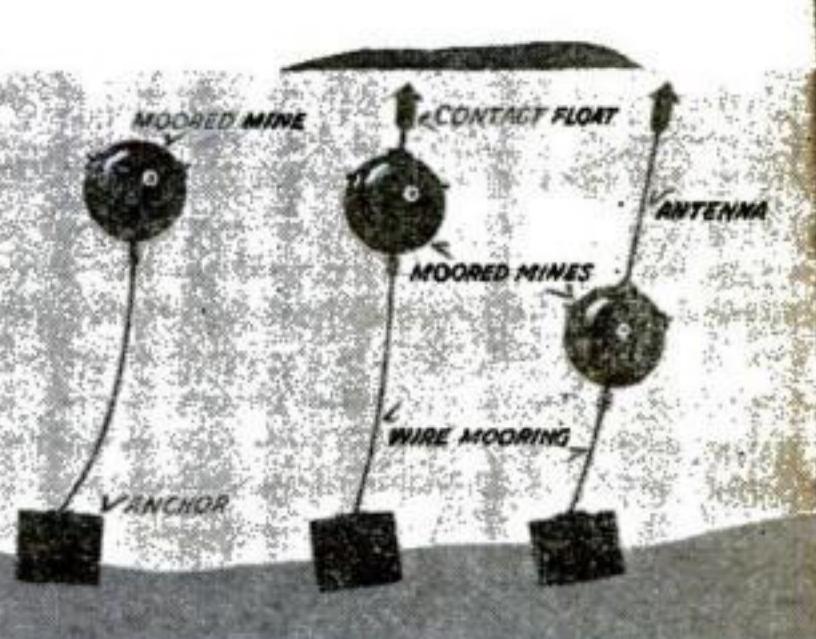
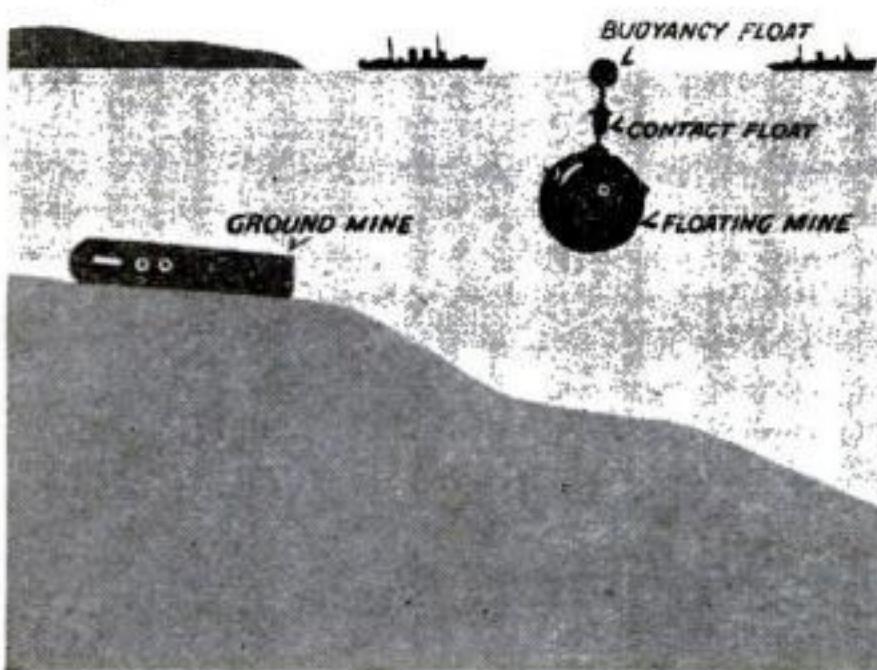
The Germans then wedded the acoustic mine to the magnetic mine. Sound prepared the mine to go off, but only after sound had removed the safety catch would the mine



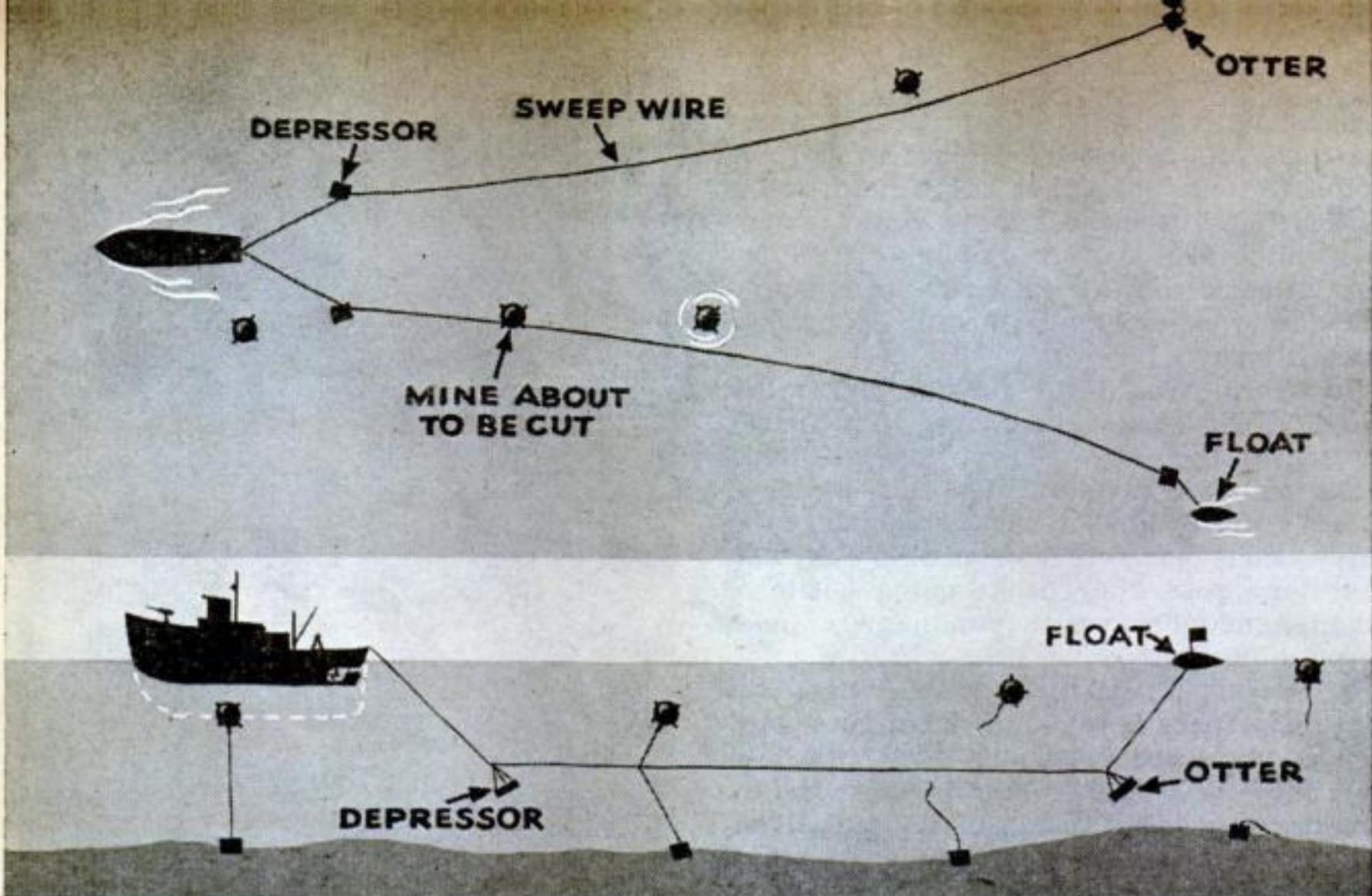
"Tail" of sweeper hunting magnetic mines has two electrodes, making closed circuit, to set them off.

detonate from magnetic influence. A shallow, light sweeper not fitted with a noise-maker could sweep all day and yet not clear a passage for heavy, noisy vessels. If the Germans later reversed the order in which sound and magnetism affected the mines, the "tail" of a magnetic sweeper could pass over them harmlessly. The mines were still there, ready to explode.

Another German trick was the "ship



Mines are of three types: ground, floating, and moored. Most moored mines are fired by contact; ground mines usually are acoustic, magnetic, or both. Floating mines, menace to friend and enemy, are rarely used.



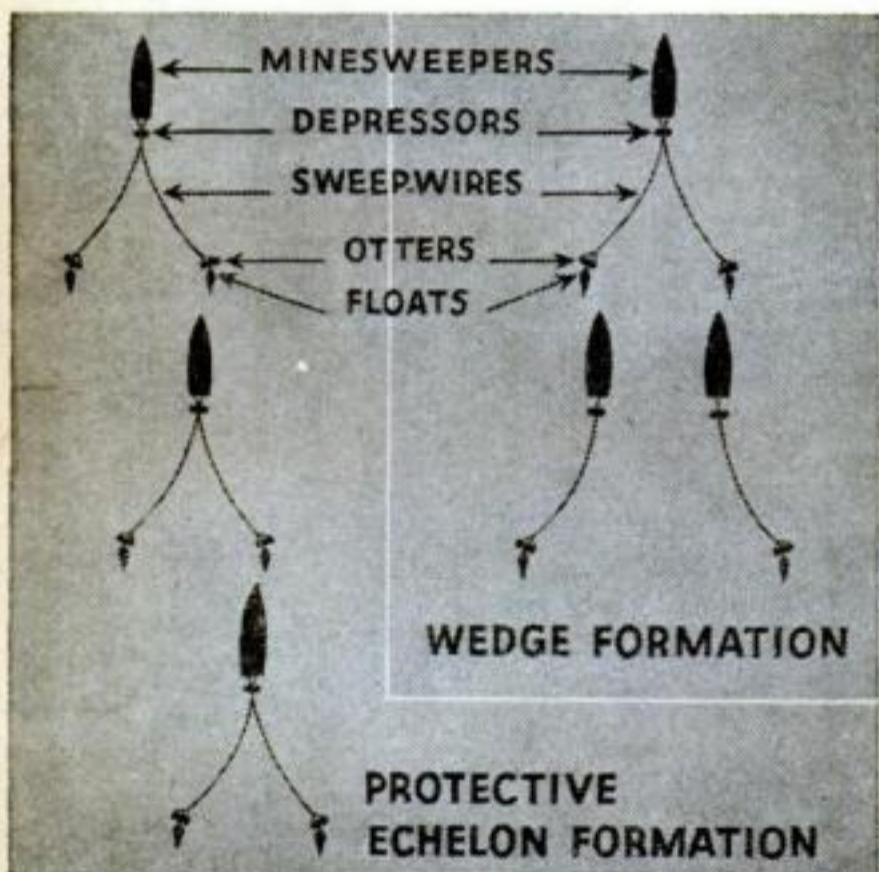
From the rough-edged sweep wire hang a "depressor," astern of the ship, and "otter." The "otter" rides below floating "pig" at wire's end. If wire doesn't cut mine's anchor line, "otter's" knife usually does.

counter." Magnetic mines fitted with counters did not detonate until a given number of ships had passed over them. Sweepers had an endless job dragging their "tails" over suspected mine fields until a "counter" went off. The Germans used this technique in an effort to catch capital ships, normally preceded in formation by sweepers, destroyers, and cruisers. "Counters" occasionally threw convoys into turmoil by sinking or damaging ships in their midst.

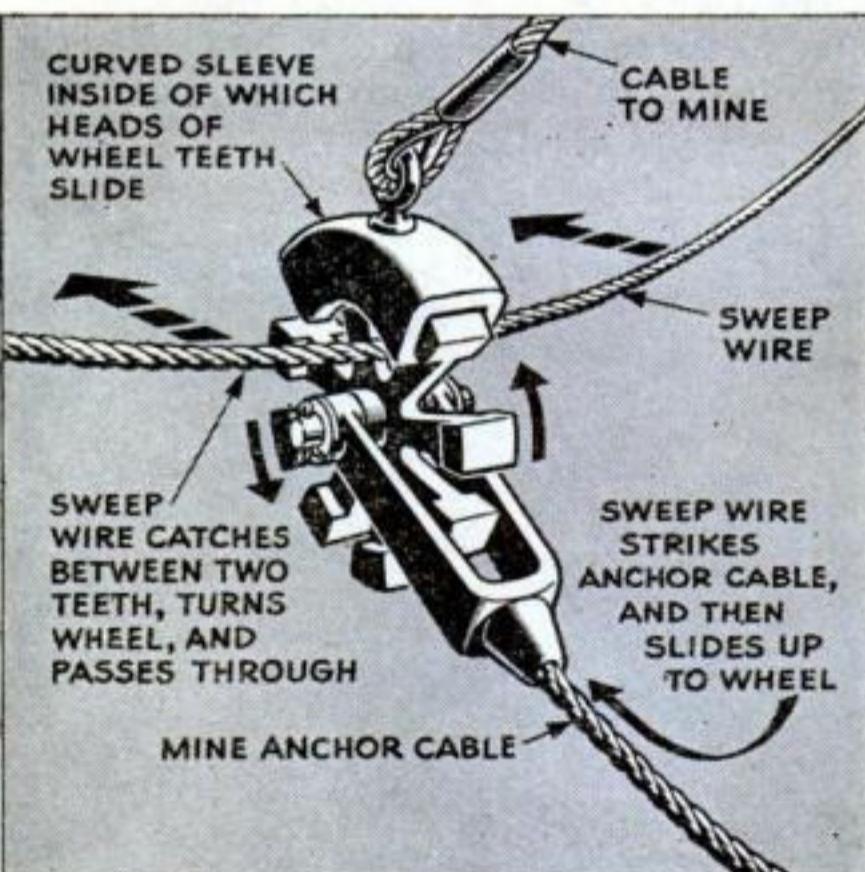
"Sweep obstructors" of various types also

complicated the job of the Allied sweepers. Some were buoyant cases containing enough explosive to part a sweep wire; others had cutters. Some were heavy chains, supported by buoys, that would break the sweep wire. The Germans actually had a mooring cable designed to let a sweep wire pass right through it, but it didn't work well.

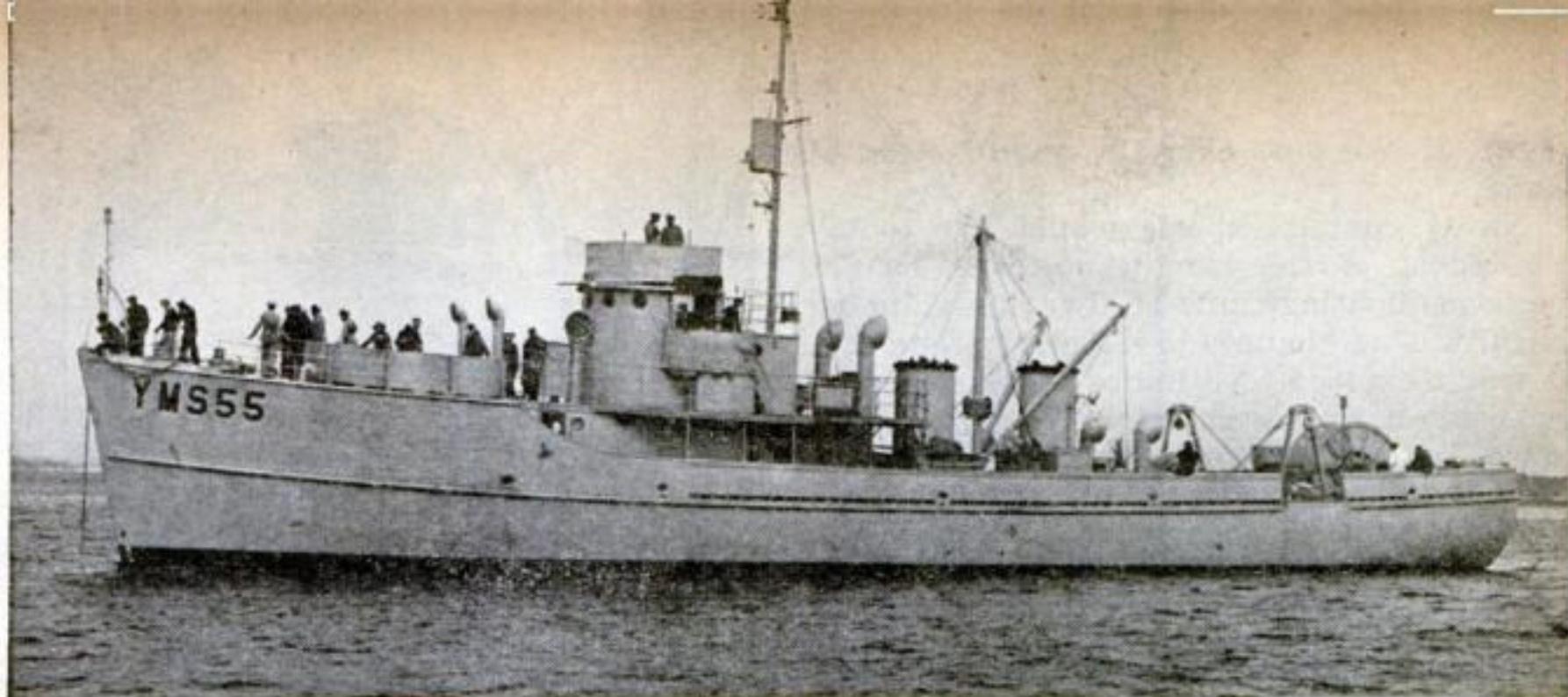
They outsmarted themselves, too, when they put 80-day clocks into mines planted off British harbors. The clocks were set to sterilize the mines after a certain date.



A leading sweeper is not a good risk, but those that follow, in such formations as these, are protected.



Germans thought this sprocket would pass sweep wires through their mine cables, but barnacles fouled it.



YMS, in naval nomenclature, labels this small, typical minesweeper as a craft 136 feet long, of 300 tons displacement. DMS identifies a much bigger sweeper, a converted destroyer of 314 feet and 1,190 tons.

When some of those mines broke loose and were washed ashore, the British experts found out when Hitler planned to attack England.

The U. S., fighting a hard war in the Pacific, began its mining operations slowly, but made up for lost time. At Brunei Bay, Borneo, we trapped a big Jap fleet unit by mining its escape route, and the next day bombers hammered the vessels unmercifully. At Surabaya, our mines cut 200,000 tons of Jap shipping a month to a trickle. We "mined in" 32 ships at a Palau harbor and polished off every one of them with bombs.

Four mines laid in a harbor on the coast of Indo-China made the Japs abandon the port. Finally, no Jap harbor in the home islands was safe for a ship.

But V-J Day posed another problem: how to find and destroy thousands of mines. In the war's first nightmare, we had mined defensively as far south as the New Hebrides. When the Jap found himself off balance, he, too, began mining defensively. Courage alone took American minesweepers into the waters off such places as Guam and Okinawa ahead of the assault boats. At Balikpapan, four out of every 10 sweepers were damaged or sunk.

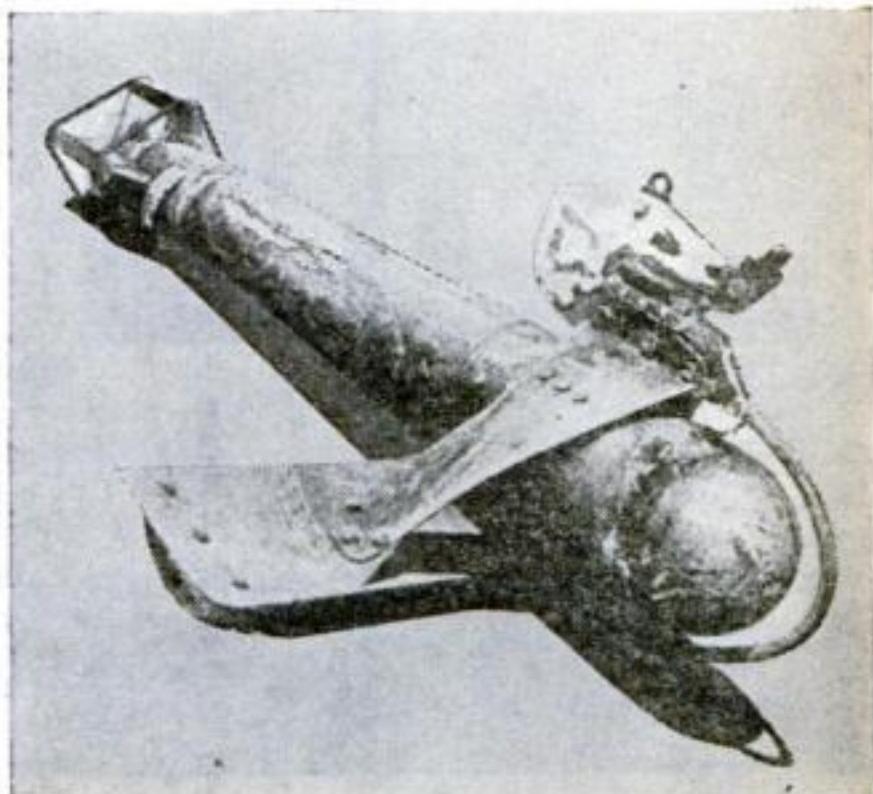
The Japs seldom used anything but simple "chemical horn" mines, which exploded on contact. But we sowed magnetic mines from airplanes with a lavish hand. Most of our magnetic mines had "sterilizing" devices to make them harmless after a time, but the sweepers can't be sure the devices have worked. Neither do the sweepers know exactly where those American-sown mines are. Pictures often were taken of them as they hit the water, to locate them with relation to the coastline, but they still may be anywhere within an area of several thousand square yards.

Marine growths can cover mines so fully that divers can't see them a few feet away,

yet not make them ineffective. And mines sometimes slip their moorings. Floating mines of the anchor type have been reported recently along the American west coast, carried there by ocean currents.

Detectives of the mining business then are summoned. If mines found floating in cold waters are covered with colonies of a certain kind of barnacle that thrives in warm waters, they know that the mine field is not likely to be near. Barnacles fasten on to things only near the surface, and a lot of barnacles indicates a long drift. One mine sleuth, notified that mines had broken loose from a defensive field near Trinidad, surmised that ocean currents eventually would carry them down to the coast of Brazil. They did, too.

Some of the many moored mines which the Japs laid will be hard to sweep because they "dip"—sink to a greater depth—in a current. The added weight of marine growths causes them to dip even more. If a sweep wire isn't set at exactly the right



An "otter" out of water, revealing the big knife with which it slashes the anchor cables of mines.

depth, it will pass over the mine instead of under it.

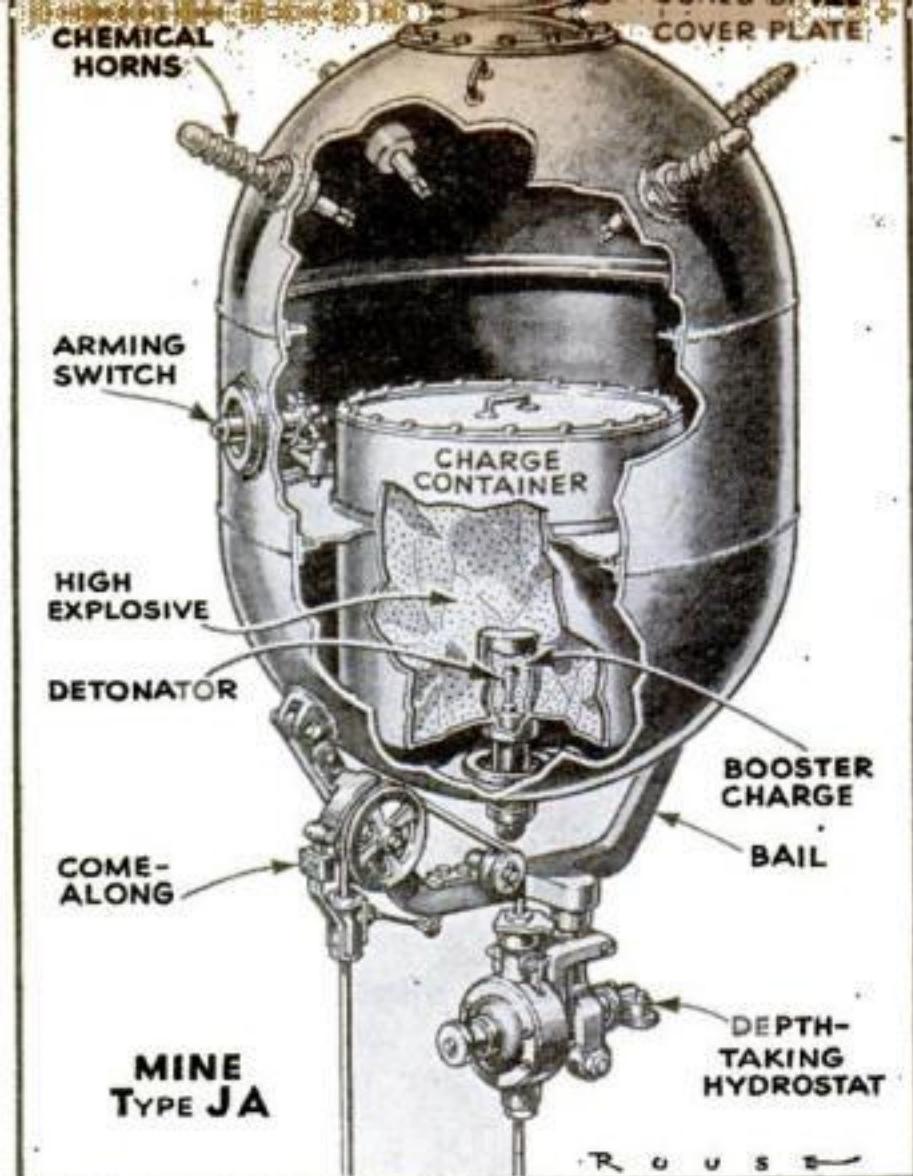
Naval mining experts would like to lay the ghost of the rumor, however, that a vagrant, floating mine is always a shipping hazard. The chances are 10,000 to one that it won't explode. All mines that are set off by contact are designed to sterilize themselves when they slip anchor. Even the Japs, who attacked without warning, saw to it that their mines sterilized themselves. They had to; a mine ready to go off is dangerous both to friend and enemy.

The 10,000 defensive mines we laid in 1942 and 1943 off Chesapeake Bay, Cape Hatteras, Key West, and Trinidad, off Kodiak in Alaska and Adak in the Aleutians, have been swept up as nearly as sweeping can account for them. Other U. S. coastal waters were defended by mines of the anchored, controlled type, built to go off when someone ashore throws a switch. They have been accounted for. Our fleet of about 600 sweepers has taken care of some 10,000 Allied and enemy mines.

TNT usually is the main charge in American mines. The Germans used it also, but added powdered aluminum to give their mines more "kick." A Japanese mine ordinarily contains picric acid, or combinations of chemicals and crude oil.

Many maverick Jap mines have been found, indicating a high percentage of improper "plants." The Japs also occasionally planted dummy mines; nobody knows why.

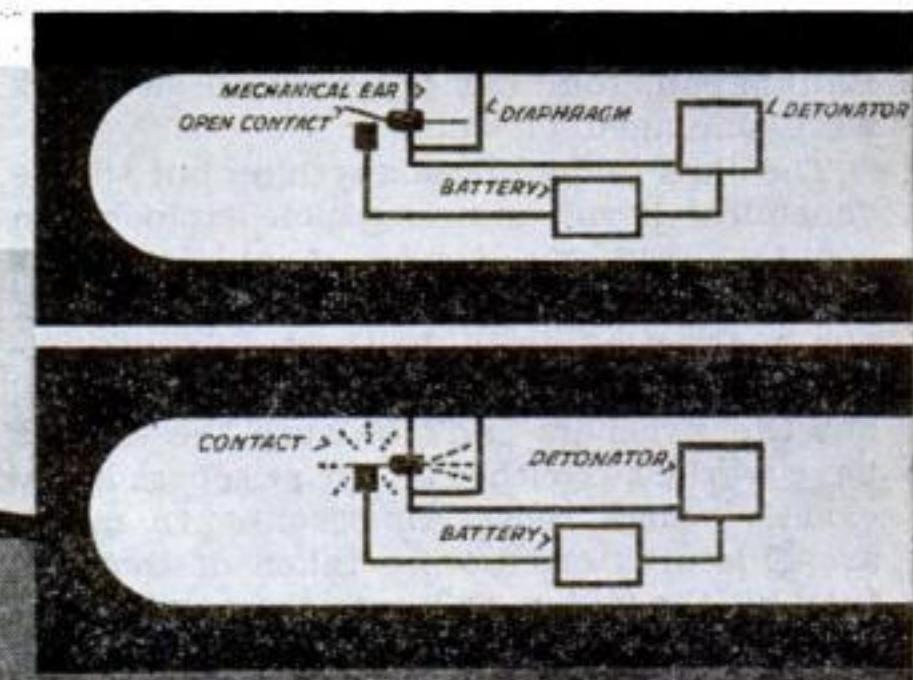
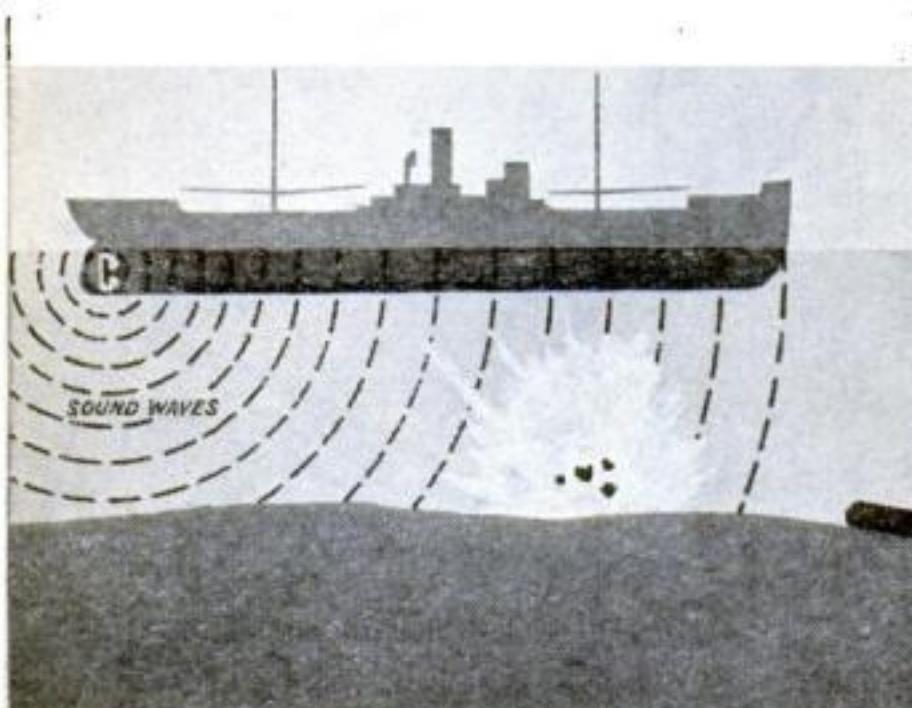
Minesweeping is under the immediate control of the individual fleet commanders, but the Commander, Minecraft, U. S. Pacific Fleet, is in charge of all U. S. minesweepers and other mine vessels in the Pacific. Under his command the vessels are organized into divisions and squadrons and then assigned to the various fleet commanders for specific



Japs used this "chemical horn" mine. When horn is crushed, acid energizes battery, sets off detonator.

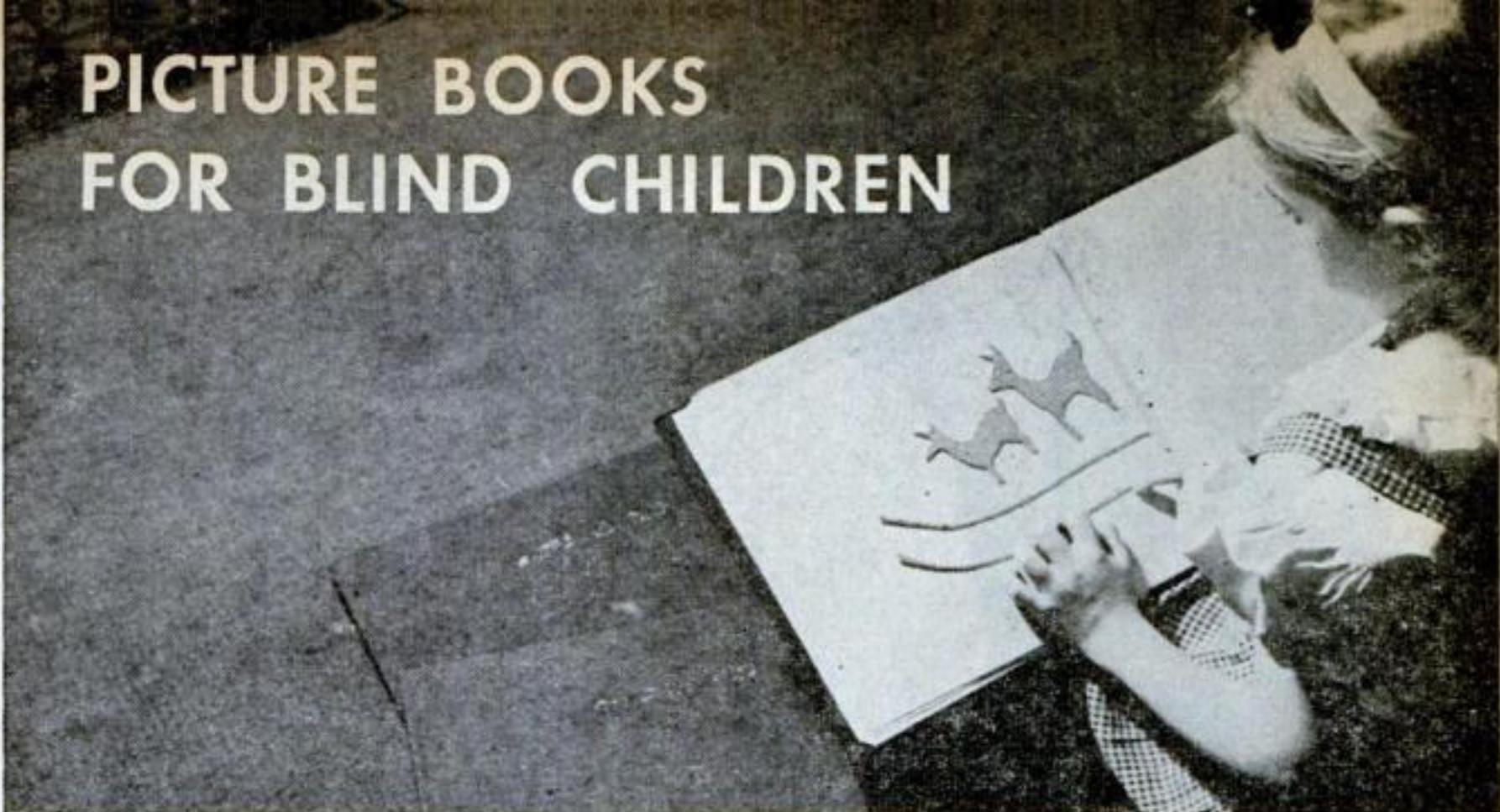
tasks. Back in Washington, appropriate bureaus of the Navy Department, under the over-all supervision of the Chief of Naval Operations, have set up training schools, experimental laboratories, building and testing facilities, supply depots and repair units, both here and overseas, to support the minesweeping forces.

How much longer it is going to take to complete the job depends in large part on the size of our postwar Navy; the smaller it is, the bigger the task. One unofficial estimate is that it may take a dreary three years. That's a long time after V-J Day for the men of the minesweepers.



This drawing shows how sound waves from an approaching vessel beat against the mechanical ear of a waiting ground mine and, as the schematic diagram indicates, activate the detonation circuit of the mine.

PICTURE BOOKS FOR BLIND CHILDREN



Angela Brown fingers a raised drawing in one of her parents' books, showing how a blind child "sees" it.

ILLUSTRATED books for blind children, said to be the first made, are being prepared and freely circulated by Mr. and Mrs. John Bass Brown, Jr., of Charlotte, N. C. It's a hobby, and one that their young daughters share. The Browns obtain publishers' and authors' permission to bring out special Braille editions of new books, with raised illustrations. Mrs. Brown pricks out the texts on Braille paper. On other sheets of it the family pastes cutout drawings that a cousin has copied on heavy cardboard.

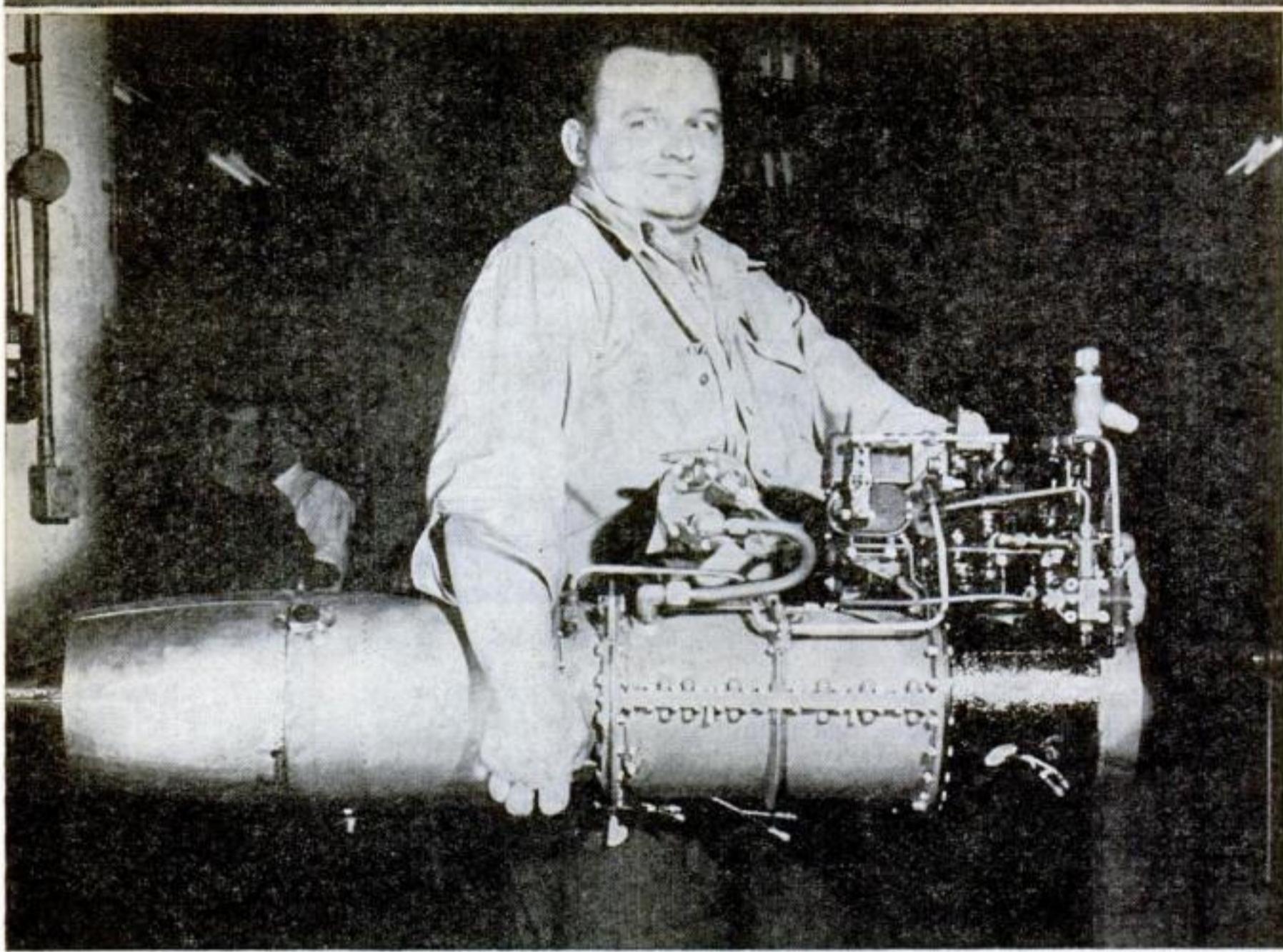
Little Mary Brown suggested the project. Angela, nine, chooses the picture books she thinks blind girls and boys will most enjoy. Her choices are popular, for demand for them far exceeds the supply.

After cardboard cutouts of illustrations are added, leaves of book are protected by coating of shellac.



Mrs. John Bass Brown, Jr., transcribes a children's story into Braille while her husband reads it aloud.





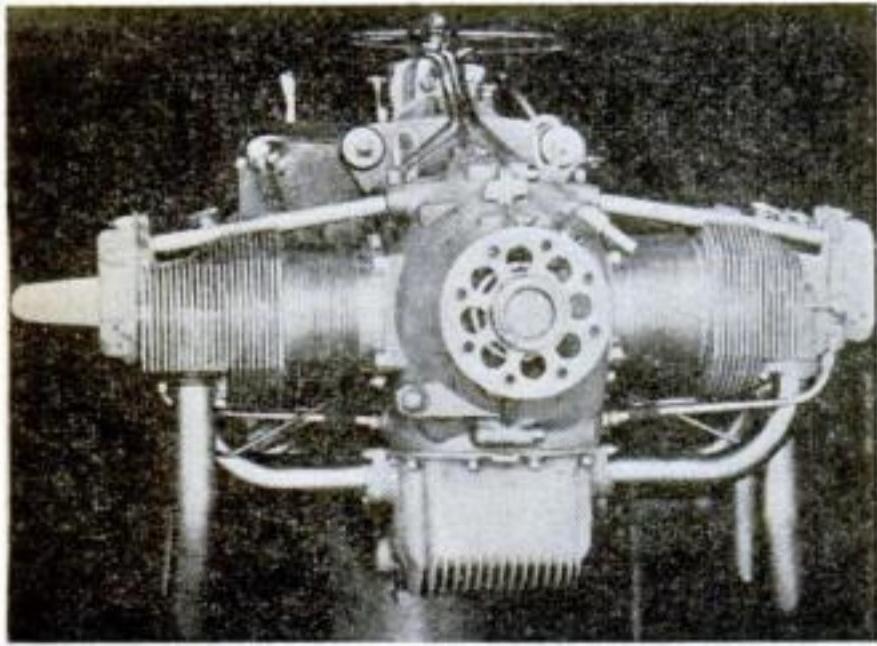
Tiny Turbo-Jet May Drive Helicopters and Lightplanes

THIS little jet-propulsion engine—it's only 9½ inches in diameter and weighs only 145 pounds for all its 275 pounds of thrust—was designed by Westinghouse engineers to power a Navy "buzzless" buzz bomb. Its turbine spins 34,000 times a minute, and its jet stream delivers 275 horsepower at 375 miles an hour. Aircraft engineers say it

may see service as a power source for aircraft cabin supercharging, wing de-icing, driving helicopters, and powering personal planes.

Utilized in a lightplane, however, it would drive a propeller rather than be used as a jet engine, since jets are inefficient at low private plane speeds.

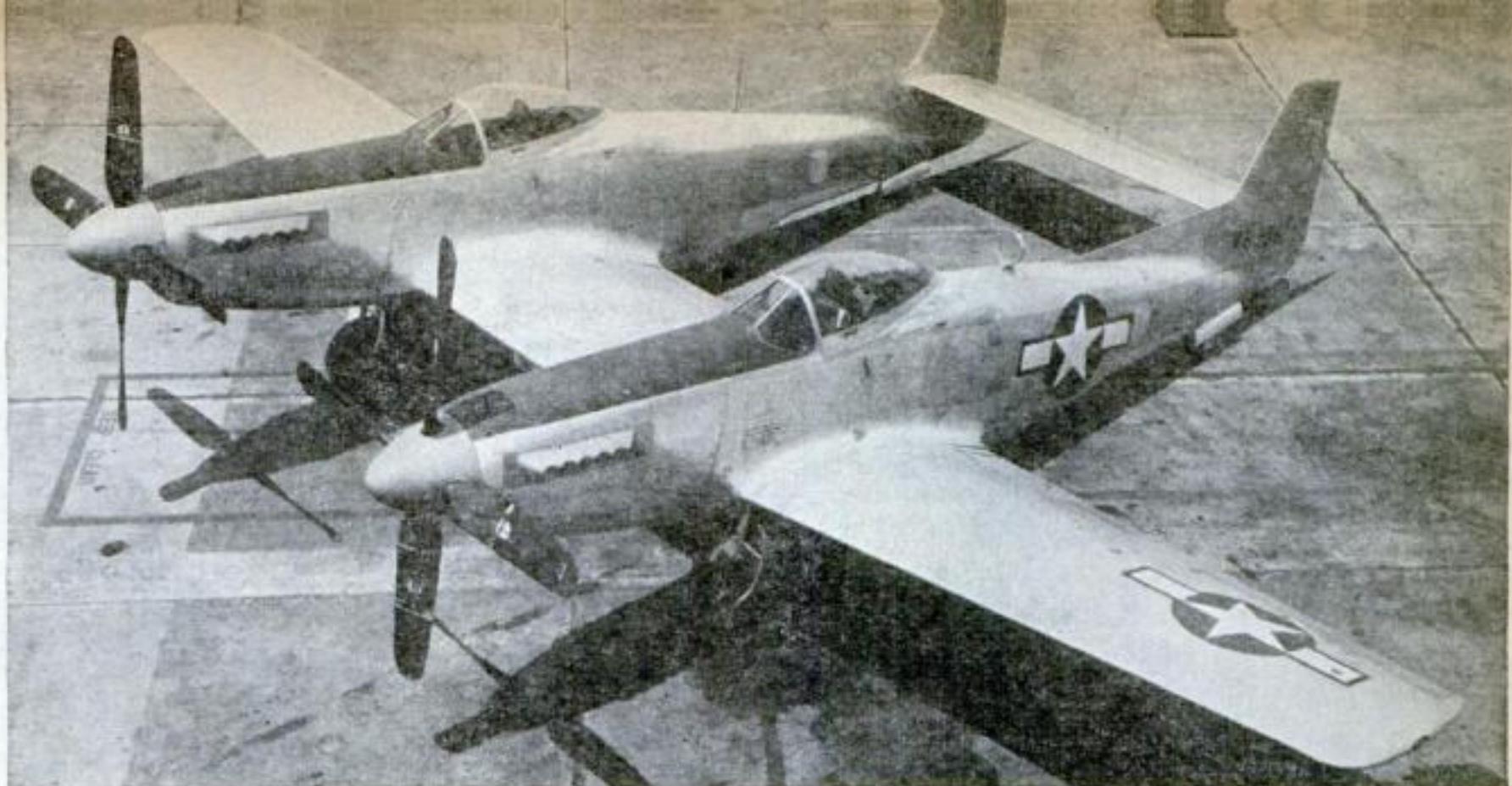
Lightplane Power Unit Uses Less Fuel Than Family Car



Simplicity of design of the new engine permits complete disassembly or reassembly in two hours' time.

THE Diesel engine shown at the left, designed specifically for low-priced lightplanes, will fly the average two- or three-place craft at a speed of 130 m.p.h. and consume only three gallons of Diesel fuel during an hour's sky ride. Currently selling at about seven cents a gallon, Diesel fuel will thus power the lightplane at one third the cost of driving the family car.

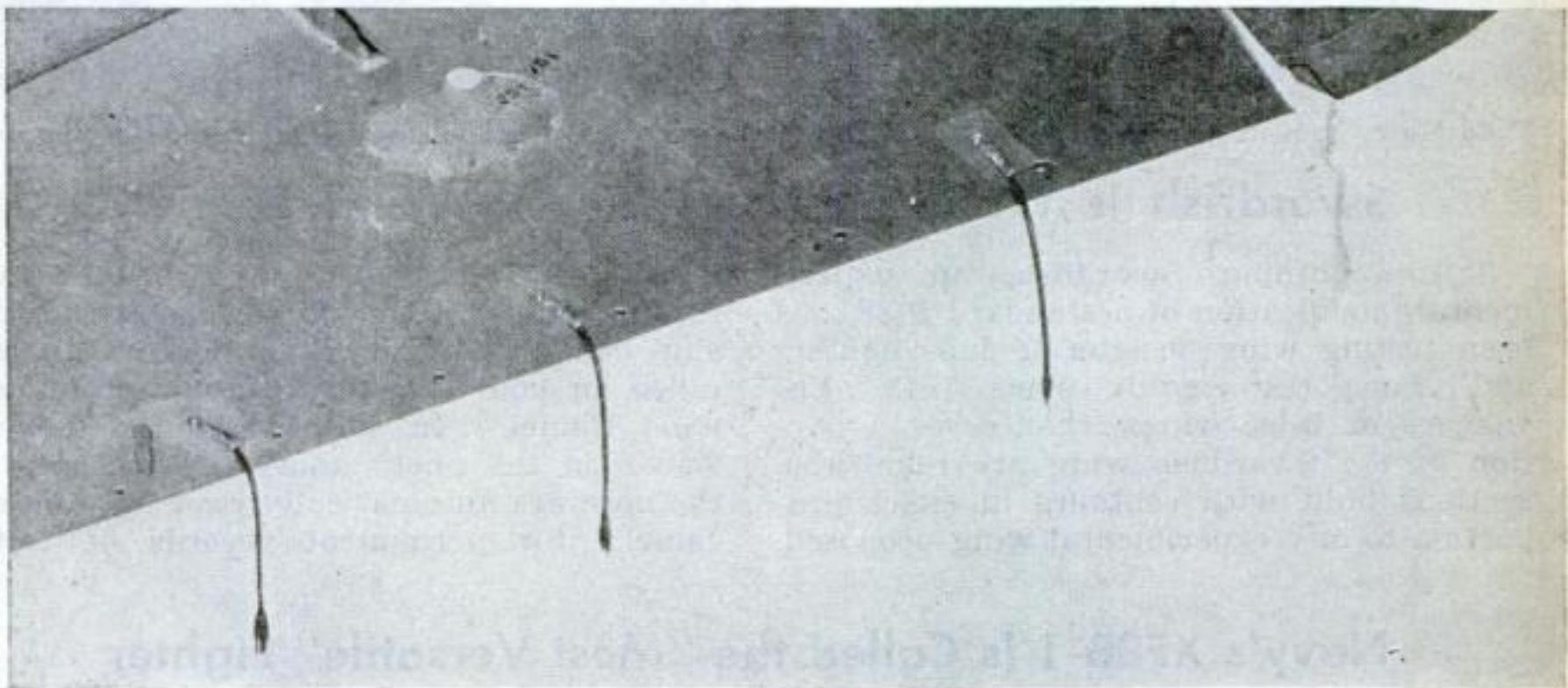
Designed by Fred A. Thaheld, the four-cylinder, air-cooled engine is being built by Diesel Power, Inc., Brea, Calif., in two horsepowers—100 and 125, with all parts of both engines completely interchangeable. Weighing no more than the conventional gasoline engine, it can be installed in any lightplane without making any alteration in the plane's design.



The "Siamese" Mustang Spells Double Trouble in the Air

TWICE as powerful as the P-51 is this North American P-82B twin-Mustang fighter and attack bomber. It's in the 450-500

m.p.h. class and has a 3,000-mile range. Pilot and copilot in the separate cockpits spell each other to cut down flight fatigue.



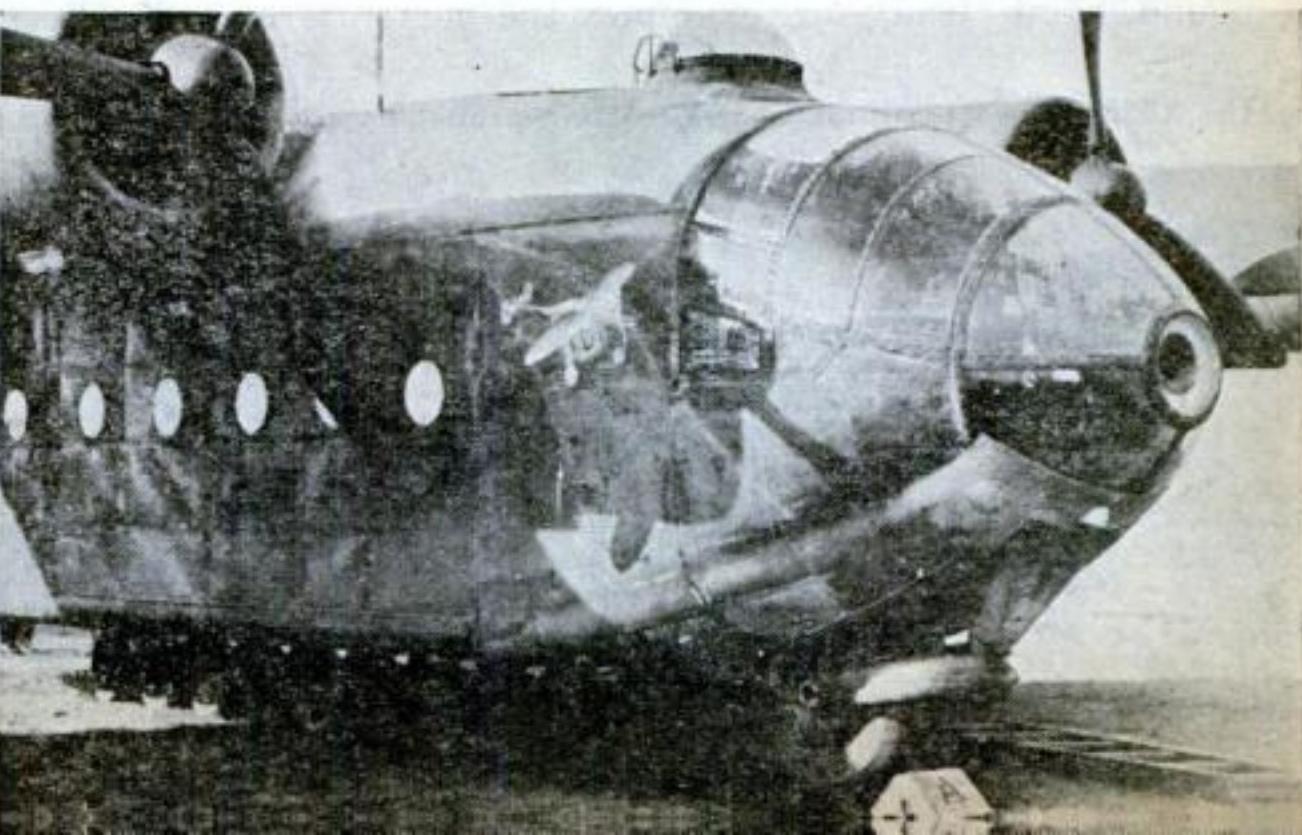
"Static Dischargers" Drain Off Stray Electricity

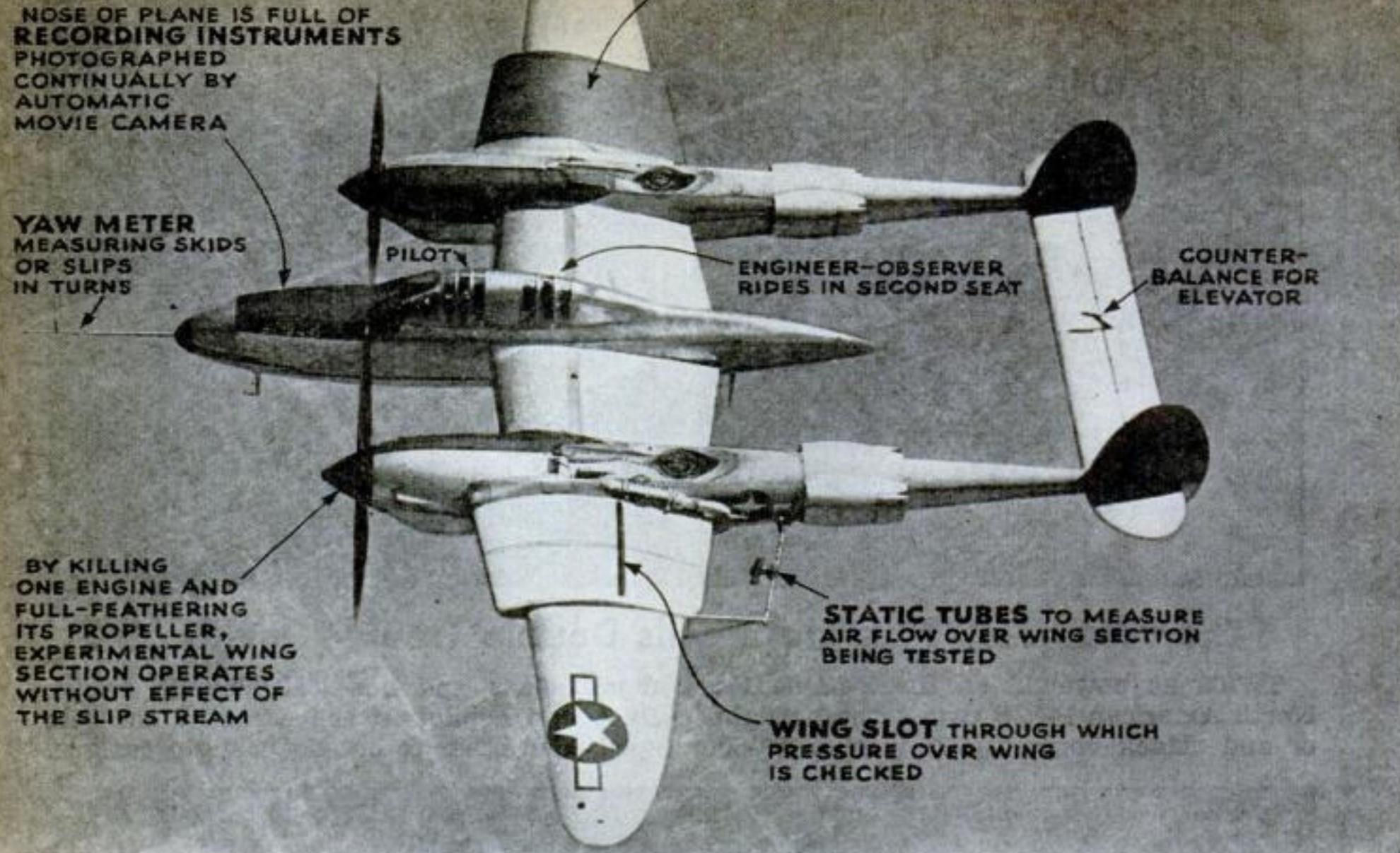
"STATIC dischargers"—foot-long wicks of cotton and plastic that dangle from the trailing edges of a plane's wing tips and

rudder and its stabilizer tips—gradually dissipate the electrical charges that might knock out an instrument.

British Plane Has 23 Wheels

WHEN this flying truck takes to the air and comes in for landings, it utilizes 23 wheels to bear its tremendous load. It is a British transport, the Arado 232B, and was regularly used in the war to carry tanks and big guns.





"Old Nosey" got its name from the five-foot yaw meter in its nose that indicates skidding and side slipping.

Swordfish Is World's Fastest "Flying Wind Tunnel"

THE Lightning Swordfish, an experimental modification of a standard P-38, has been testing wing designs of superfighters and transports secretly since 1943. Envelopes, or false wings, that cover a portion of the Swordfish wing are removable sections built with contours in exact proportion to any experimental wing proposed.

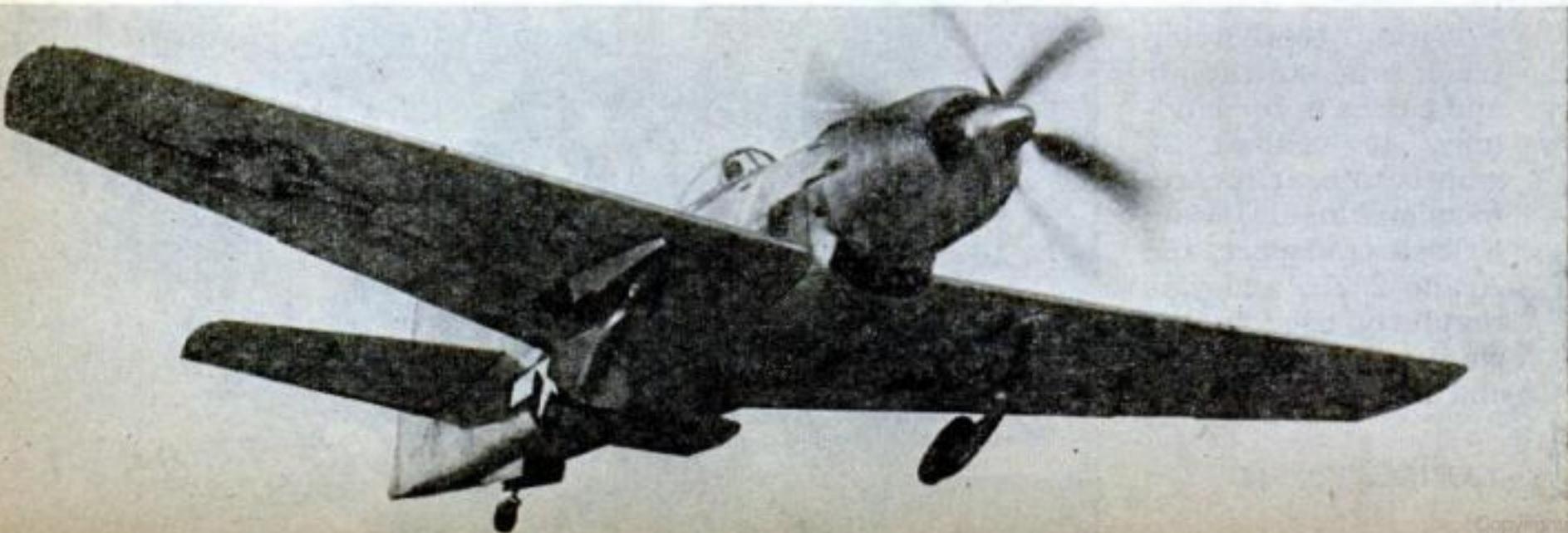
Fitted to test drag, lift, and airflow characteristics under actual flying conditions, the ship can dive at speeds of more than 525 miles an hour—the world's fastest "flying wind tunnel." In addition to the devices shown in the photo above, instruments in the nose are automatically read by a movie camera for permanent records of tests.

Navy's XF8B-1 Is Called the "Most Versatile" Fighter

CALLED the most versatile fighter in the world, the XF8B-1, developed by the Boeing Aircraft Company for the Navy, can be used as a bomber, torpedo plane, attack plane, or interceptor, or in many combinations of these types. After dropping a 6,400-pound bomb load, for example, the new

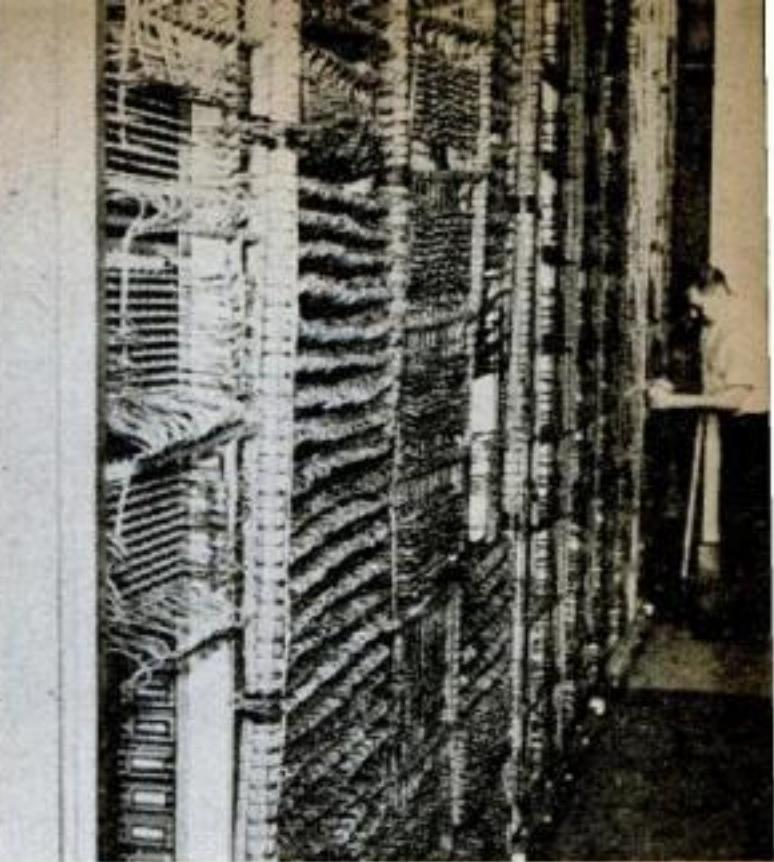
fighter will be capable of a speed far in excess of 450 m.p.h. If used as a torpedo plane, it can be fitted with two 2,000-pound "fish." Armament consists of six 20-millimeter cannons mounted in the wing and sighted by remote control. The fighter's service ceiling is over 35,000 feet.

The XF8B-1's two 13½-foot, contra-rotating propellers are powered by a 3,600-hp. Pratt & Whitney engine.





Transmitters at left give the differential analyzer its problems. It solves them on cylinders and typewriters in right foreground.



Inside of "brain" is a ceiling-high maze of wires, tubes, connections.

M.I.T.'s 100-Ton Mathematical Brain Is Now to Tackle Problems of Peace

THE 100-ton "brain" at the Massachusetts Institute of Technology is ready to turn its attention to complex problems of peace in every field of science and engineering. During the past three years, this giant calculating machine, deliberately rumored to be a "white elephant" to deceive the enemy, computed complicated range tables for U. S. Navy guns, supplied fire control data, and figured out radar antenna designs. In a few minutes, or in a few hours at most, it provided answers to these and other complex problems it would have taken trained men weeks to solve.

Able to tackle three problems at a time, with as many as 18 variables in any one, the calculator contains 200 miles of wire, 2,000 electronic tubes, several thousand relays, and about 150 motors. Yet, despite its apparent vast complexity, one man can operate it.

Technically called an "electro-mechanical differential analyzer," the huge machine is fed problems in coded symbols on perforated paper tape. It selects the units it needs, and gives its answers in numbers on electric typewriters, or as graphs on rotating cylinders, or both.

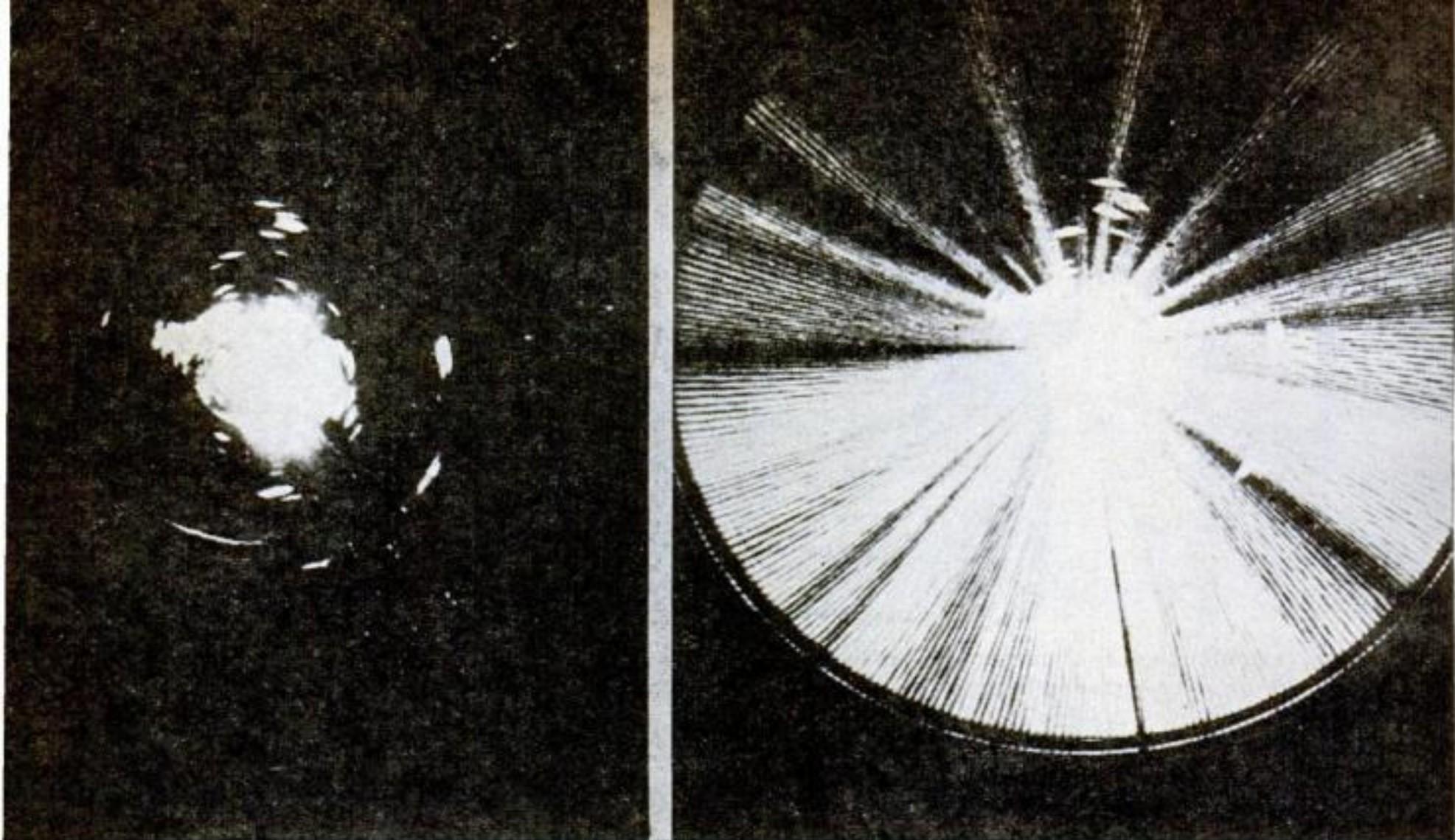


On this perforated paper tape, complex problems are given to M.I.T.'s huge calculating machine to solve.



"Hedgehog" Hurled Deadly "Quills" at Nazi Subs

ONE of the most effective weapons in the United States Navy's long, grim battle against enemy submarines was the "Hedgehog," a novel depth-charge projector that was mounted on the bow of a ship and threw its charges forward. The depth bombs were carried on rows of "spigots," as the photograph at left shows; were propelled by cartridge charges, and could be aimed to bracket a fleeing U-boat.



An unjammed PPI (Plane Position Indicator) radar scope shows spots of light for each approaching plane. Electronic jamming (right), done with specially designed radio transmitters, blots out the targets.

FOOLING ENEMY RADAR

How "window," "rope," and "ferrets" scrambled German and Jap scopes to save U. S. lives.

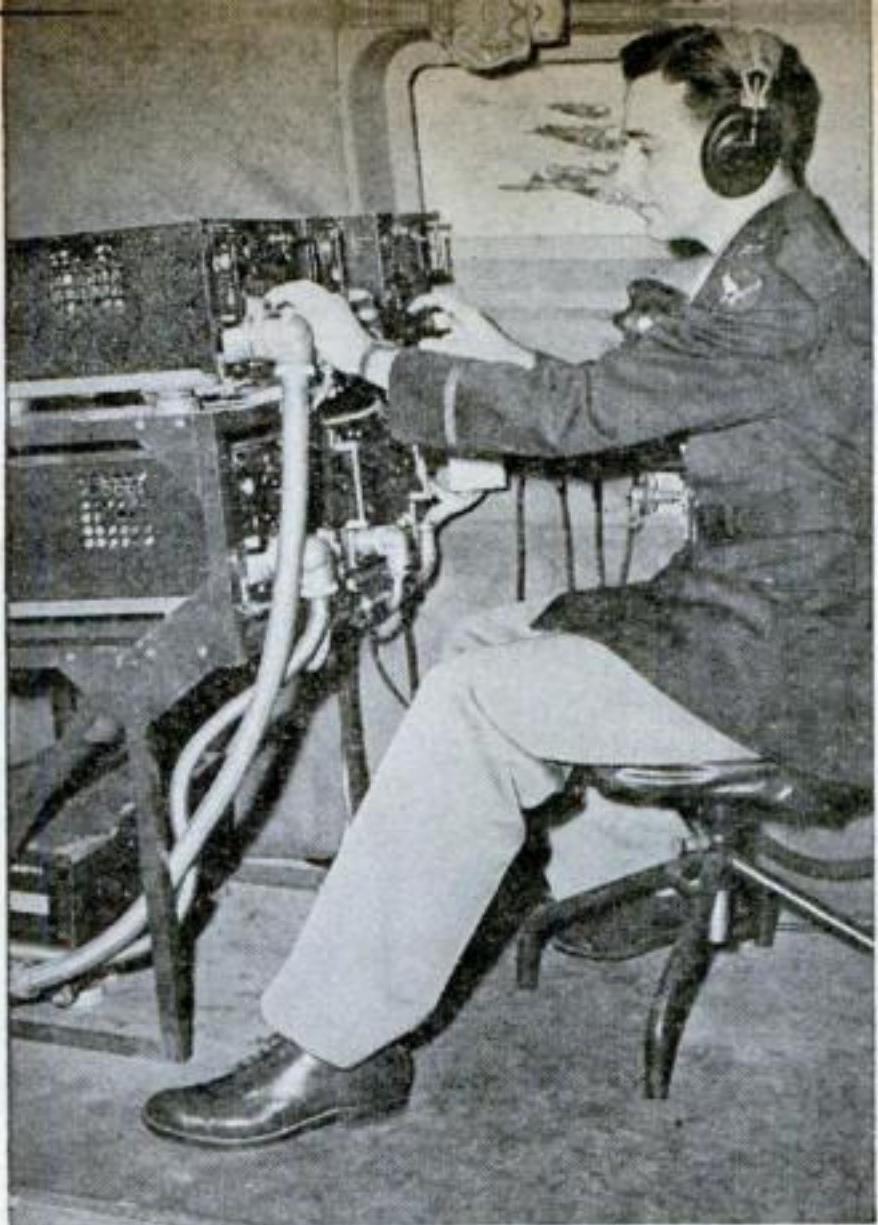
"**O**PERATION Overlord," the invasion of Normandy, has gone down in history as the most stupendous military undertaking of all time. But it might have been history's bloodiest debacle if there had been no radar countermeasures. These were provided by the technicians in a top-secret "RCM" project.

The 200 miles of Fortress Europe between Dieppe and the Cherbourg peninsula bristled with radar stations. Two or more sets for early warning and fire control were installed at each of some 50 sites; in one section, these electronic watchdogs were only a mile and a half apart. If they had detected the departure of our sea and air armadas from Britain, murderous fire from the many coastal batteries and antiaircraft guns could have ruined the whole Allied plan.

But several things happened to the Nazi radar network. Some stations were knocked out by gunfire, rockets, and bombs from pre-invasion air sweeps, but those remaining were the problem. Even three or four radars in operation would have tipped off the whole show. Those intact radars were made impotent by some of the cleverest mili-

tary legerdemain ever performed. A large Luftwaffe fighter force spent most of the night of June 5, 1944, and the following morning circling inland around Calais, looking for a ghost bomber force that never appeared. The antiaircraft "Wurzburg" radar operators saw 20 times the number of planes—and there were plenty—that actually took part in the invasion. The "scopes" of Nazi gun-aiming radars were hopelessly cluttered with crazy-dancing lights, and others pointed the menacing coastal batteries toward spots in the Channel where there were no ships.

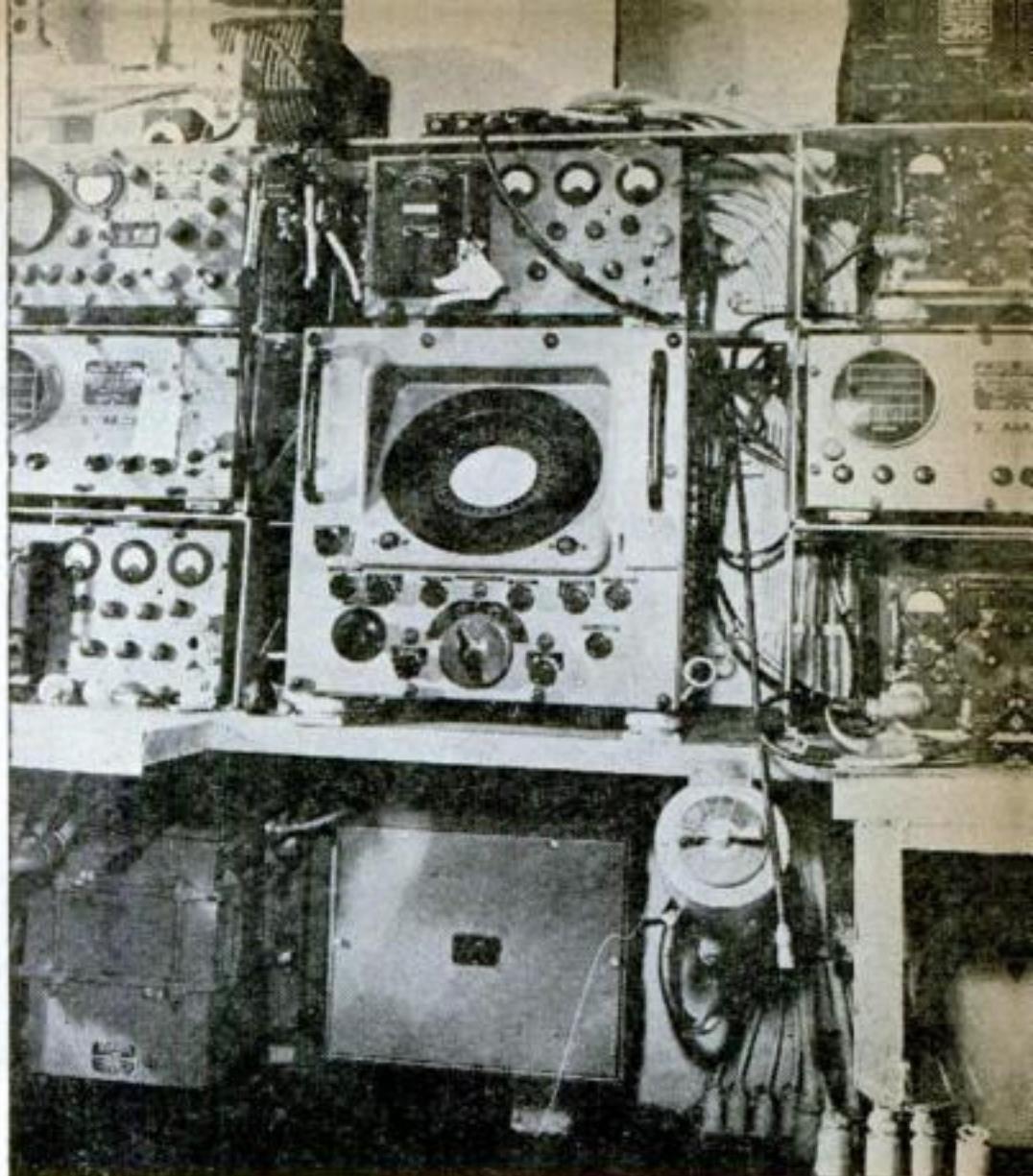
We foiled—literally and figuratively—Jerry's radar by dropping clouds of aluminum foil, the same silvery wrapping taken from chewing-gum and cigaret packages during the war years. These narrow foil strips that resembled Christmas-tree decoration were called "window." The rolls of long foil streamers that were used later in the war to clutter up Jap radars were known as "rope." Both the metallic strips and the ribbons were electrically resonant at the frequency of the radio waves sent out by the enemy radar. Hence, a few strips could return an echo in the enemy's radar



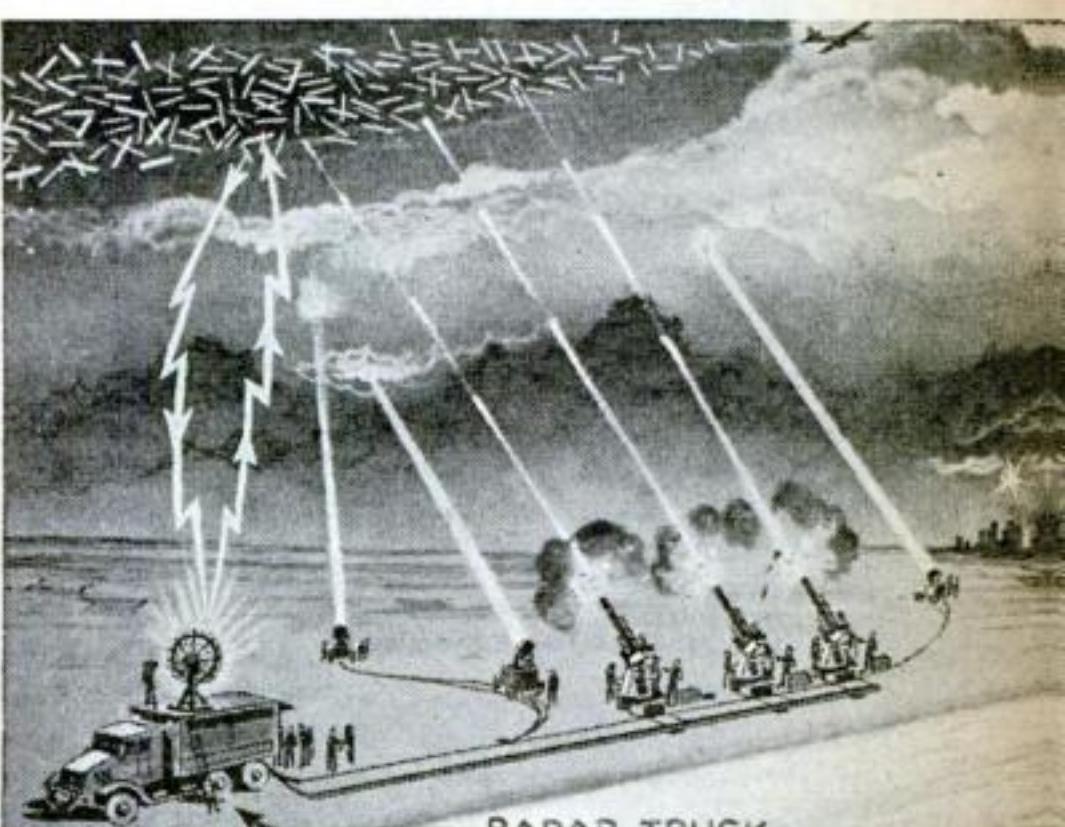
Spot jammers mounted in B-17s and B-24s blurred radar fire-control of German antiaircraft defenses.

scope that looked to him like a large object, such as an airplane or ship. A great quantity of "window" would light up his whole screen, so that the light "pip" that was really a plane was blanked out in the blaze of lights and shadows.

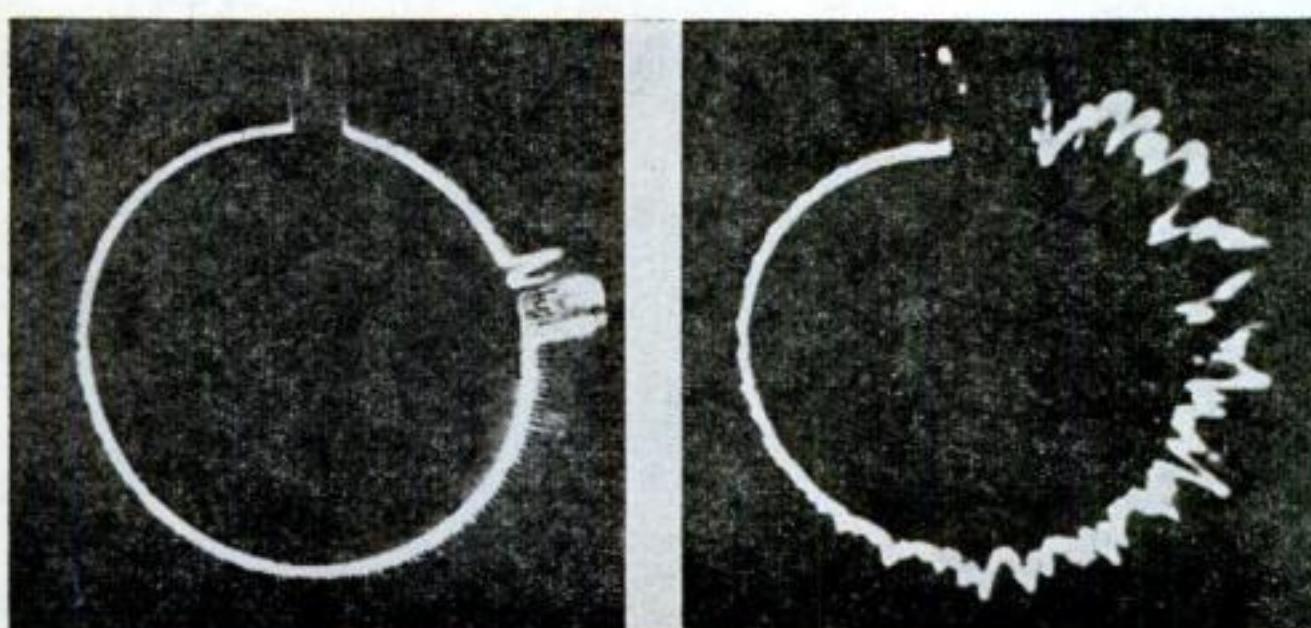
Another way of making an electric window in the enemy scope was electronic jamming. This was done with specially designed radio transmitters which could be carried in a plane or ship and used to send out signals that would cover up the enemy's radar signals. Radar works on the echo principle. A beam is projected outward or upward to scan the area for approaching planes or ships or other objects. When the high-frequency radio beam hits an object, a portion of the beam is reflected back to the radar, like a bouncing *(Continued on page 228)*



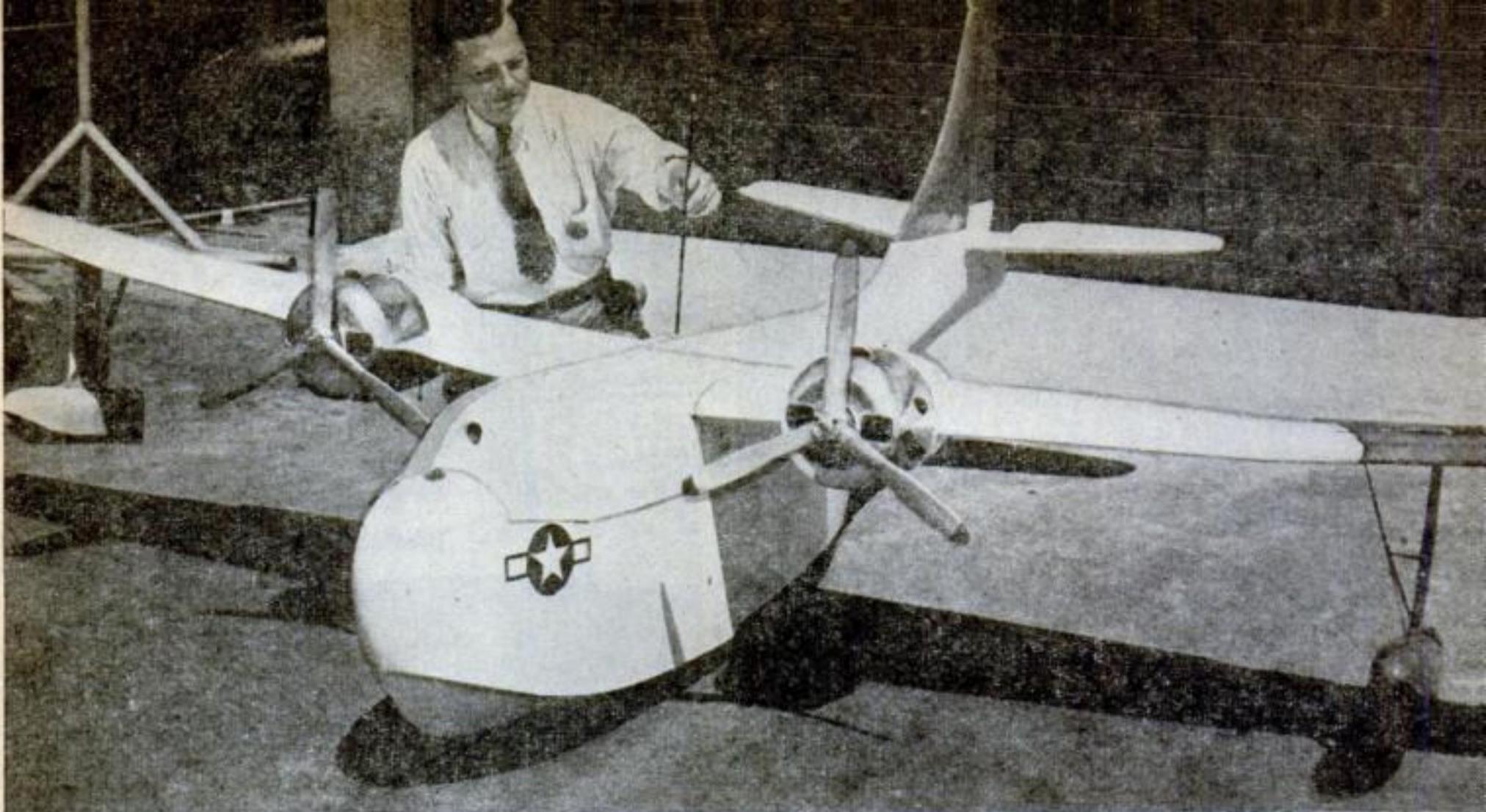
A typical installation on a U.S. warship that located enemy's radar and shot out confusing signals.



Flying above a cloud cover, a bomber drops clouds of "window"—strips of paper-backed tin foil—diverting aim of enemy guns while plane escapes (P.S.M., Sept. '45, p.69).



A captured German training film shows how Allied window jammed the "Wurzburg" radar scope. Clear scope shows planes coming in at "3 o'clock;" right, window creates confusion.

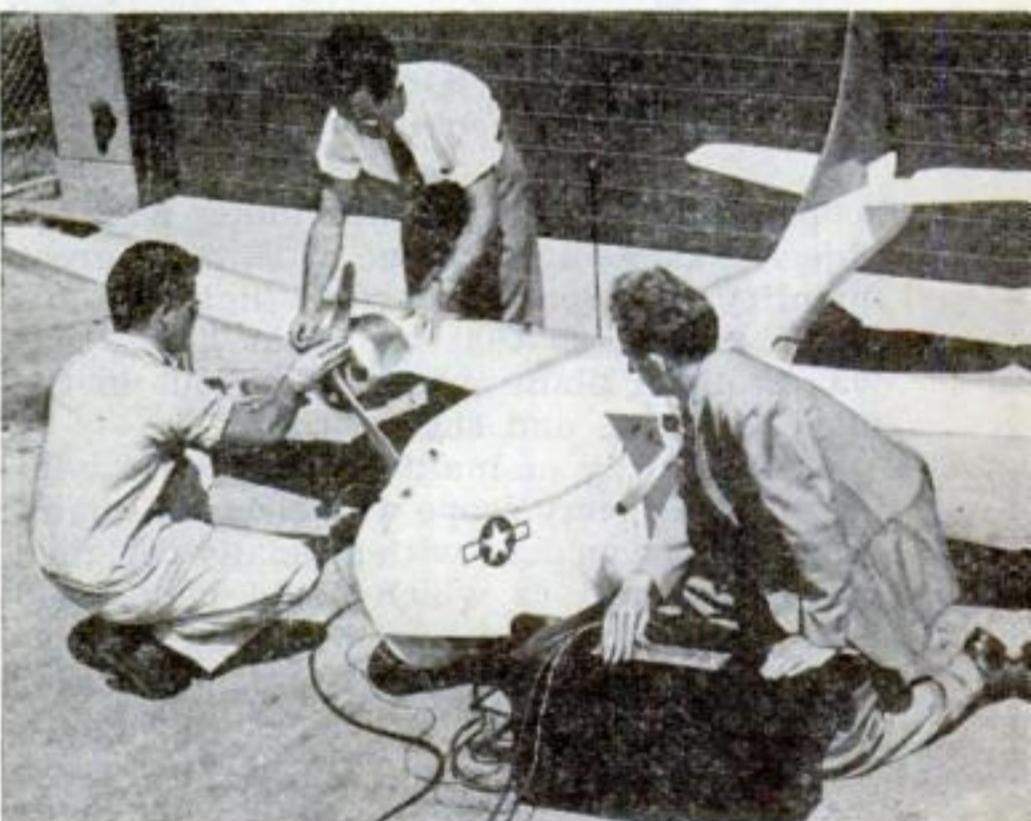


Designer adjusts the plastic-covered antenna. It takes three men (right) to start the midget engines.

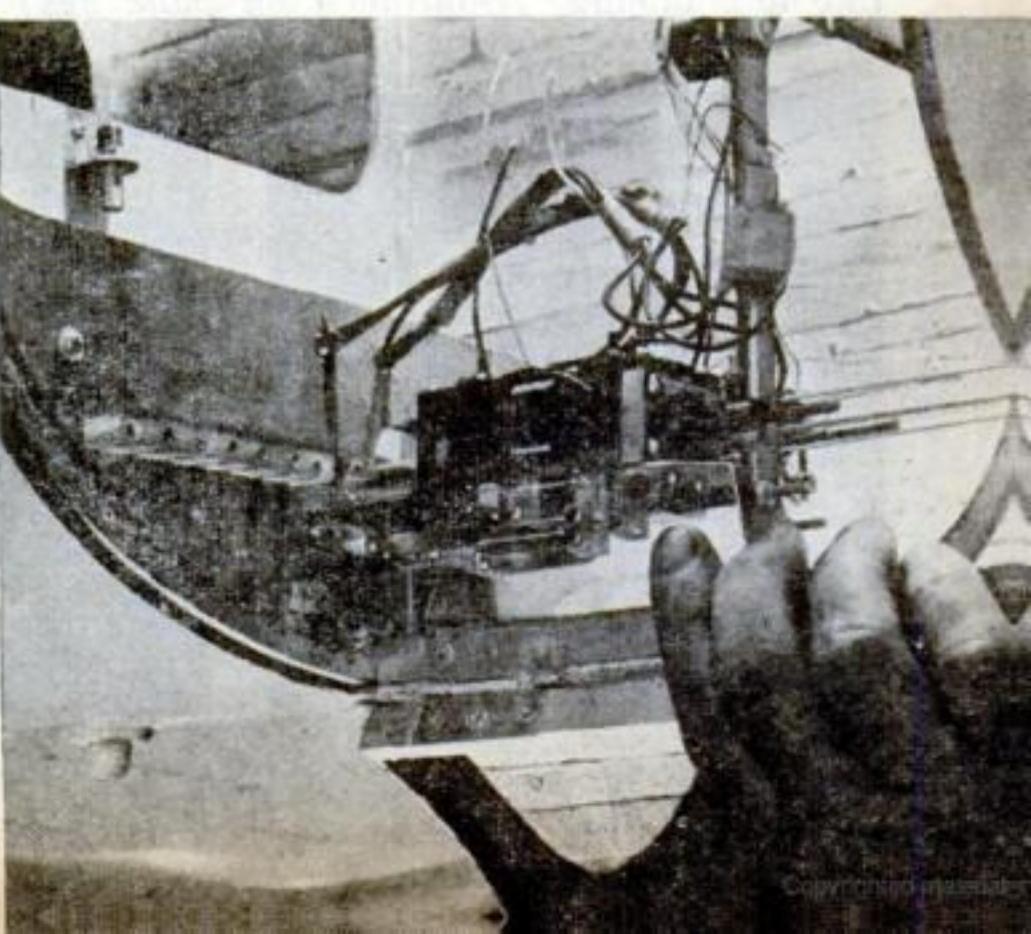
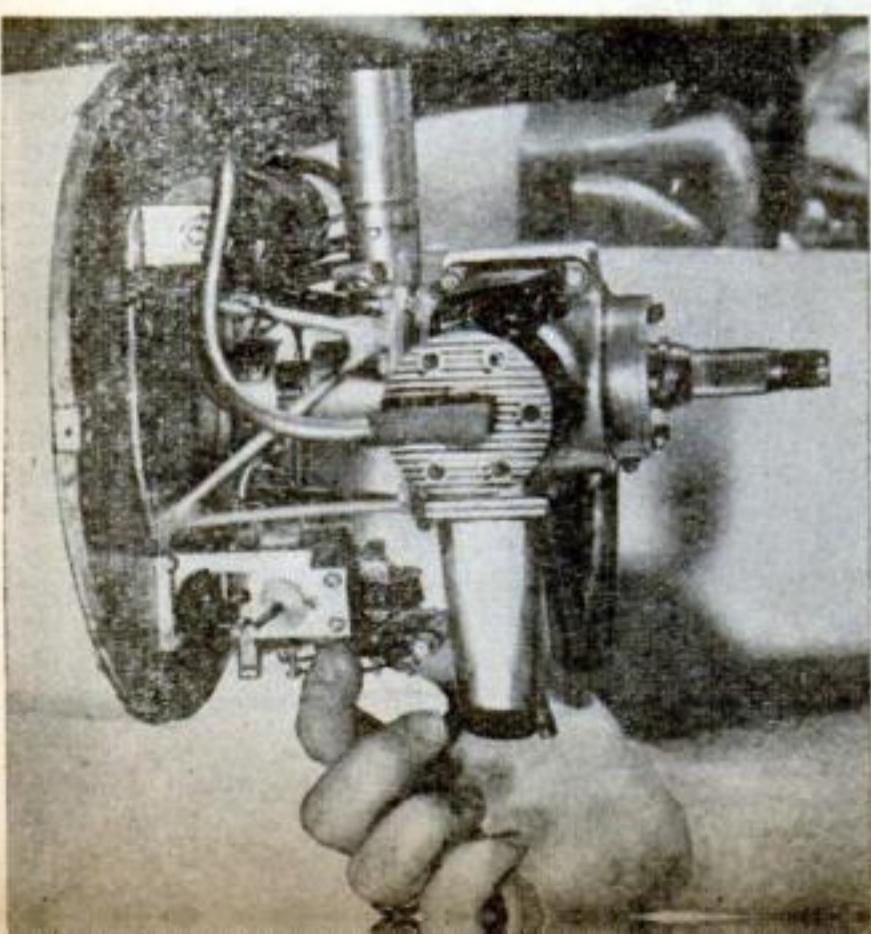
Radio-Controlled Flying Boat Tests Designs of New Craft

CONTROLLED by radio at distances up to 3,000 feet from the transmitter, the flying boat shown here climbs, rolls, dives, and descends gracefully to landings on the waters of San Diego Bay. Developed by Ernest G. Stout, of Consolidated Vultee, the twin-engine craft has a wing span of 13.75 feet and is 9.25 feet long. Each of its two-horsepower engines can spin the two-foot propellers up to 5,000 r.p.m. The pilot, sitting on the shore, controls the boat through a radio receiver in the hull.

Boat's radio receiver sets all controls through tiny servomotors. This one operates tail assembly.



One of the two servos (below) that control engine throttles. Each motor weighs less than three ounces.



NEW "FIRE" IN DIAMONDS



Splashes of light, made visible by thin cigarette smoke, show how a diamond's many-angled facets reflect rays.

First major improvement in diamond cutting in 300 years adds new facets and new brilliance to the stones

By ALDEN P. ARMAGNAC

GEAM diamonds now appearing on the market have more brilliance and fire than ever, as a result of the first major improvement in the ancient art of diamond cutting in 300 years.

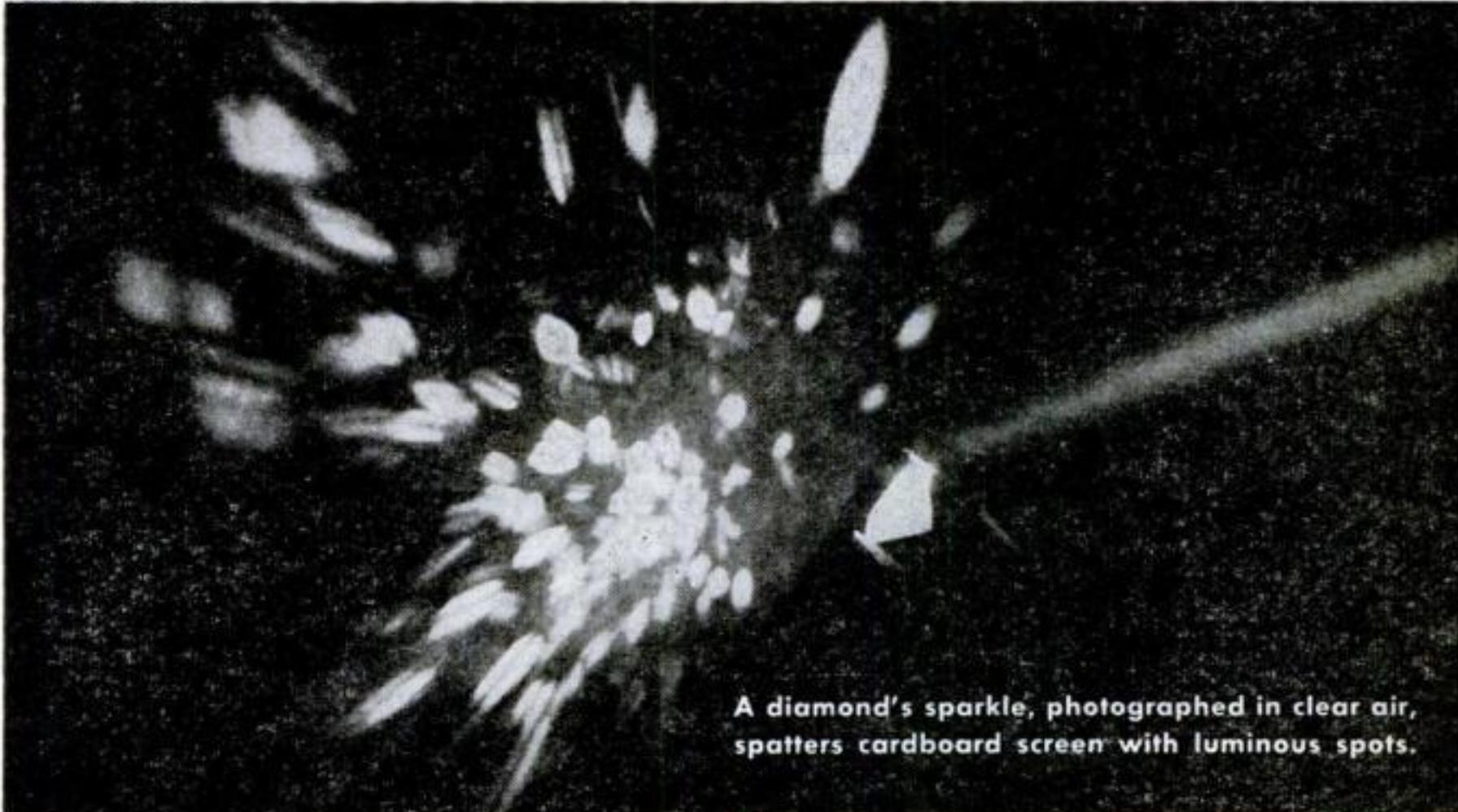
The more sides or facets that are cut in a diamond, up to a certain point, the greater its over-all brilliance—its total reflecting power. The facets multiply the number of paths which entering rays of light, rebounding like balls on a billiard table, may travel before emerging in the familiar glitter.

Meanwhile, the light rays are bent and split into rainbow colors, producing the bright-hued flashes popularly called the "fire" of a diamond.

It is possible to produce a diamond with hundreds of facets, but the tricky optical problem of arranging the faces at the most favorable angle to each other seems to set a practical limit.

Vincent Peruzzi, a 17th-century Venetian craftsman, believed he had reached this limit when he originated the 58-facet cut. Jewelers agreed with him until recently, and the American-type "brilliant" cut, a modern 58-

BRAS-CARTIER





Exceptional flawlessness marks this rough diamond for distinction.



Top is cut off first, leaving ample room above girdle for facets.



This angle is used almost universally when the bottom is cut off.



Similar cut completes rude shaping of jewel.



The intricate facets have now been formed on a rotating "lap."



Top view of the completed diamond; now it's ready to be set.

facet modification of Peruzzi's design, enjoyed unchallenged popularity.

From incoming European craftsmen, New York City inherited the father-to-son profession and became a diamond-cutting center in its own right. Leading gem designers applied the latest ideas in optics. Almost simultaneously, three New York firms came out with independent, patented ways of making "super-diamonds" with more than 58 facets:

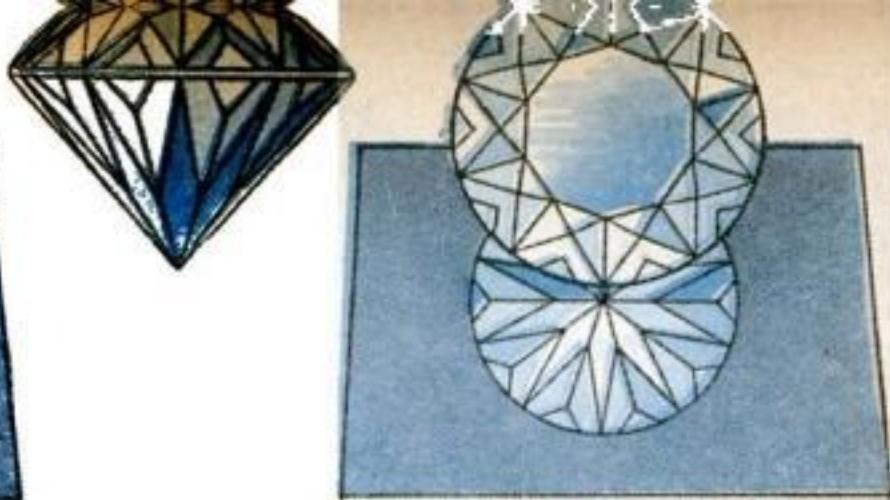
The King Cut, introduced by the King Diamond Cutters, provides 86 active light-reflecting facets, both above and below the "girdle" or edge of the stone. The large "table" or central facet of the upper side has 12 sides, instead of the traditional eight, and thus provides more edges to join symmetrically with other facets. Despite the delicacy of the work, this intricate design may be applied to all sizes of diamonds down to 12 points (12/100 of a carat).

The Multi-Facet Cut, pioneered by the firm of Louis A. Roselaar, preserves the general design of the "brilliant" cut. Extra facets of the newer design are added to what might be called the forgotten part of a diamond. A jeweler's "loupe" (magnifying glass) clearly reveals a thin, unfinished line of rough diamond at the girdle of a standard-cut stone. Separating the upper and lower facets of the diamond, this nearly microscopic band contributes nothing to brilliance. But in the Multi-Facet Cut, ex-

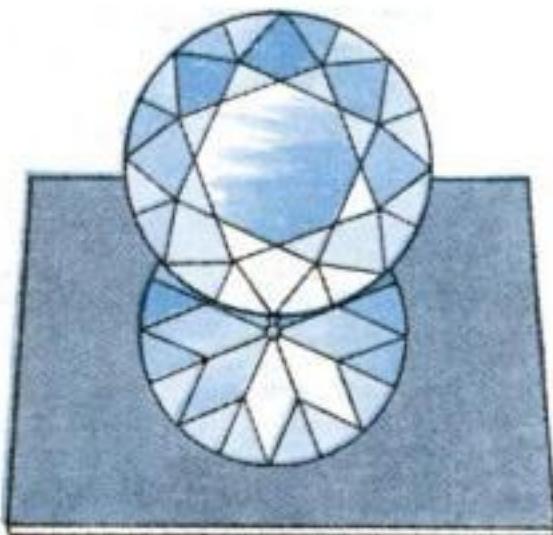
pert workers polish 40 facets into the perimeter of the girdle, making, with the original number, a total of 98. For the first time, every pinpoint on a diamond's surface contributes to its luminous quality. Light-measuring tests, conducted at the Electrical Testing Laboratories in New York by Dr. Frederick H. Pough, of the American Museum of Natural History, show an improvement in brilliance considerably beyond what a layman might expect from the smallness of the girdle facets.

Radical departure from standard shapes and arrangement of facets gives the remarkable total of 102 facets to the Magna-Cut, created by George Fine, of Max Fine and Sons, Inc. One prominent innovation, a new shape for the top or table facet, makes it a 10-sided figure. Outlining this calls for a diamond cutter of exceptional skill. An eight-sided figure is easy: Nearly everyone can draw a fairly good square. Superimpose another square at a 45-degree angle to the first, and you have the eight-sided or octagonal table of the standard 58-facet brilliant cut. But drawing a five-sided figure, or pentagon, is not so easy. Nevertheless, the first steps in making the Magna-Cut call for outlining a perfect pentagon, and then another at a 36-degree angle to the first.

The increased skill and labor required in the latest cuts obviously add materially to production costs. Nevertheless, a customer may buy a diamond ring of one of the new



KING CUT diamond has 86 facets, in contrast to the 58 once thought to be the largest feasible number. Mirror helps show how 86 facets are arranged.



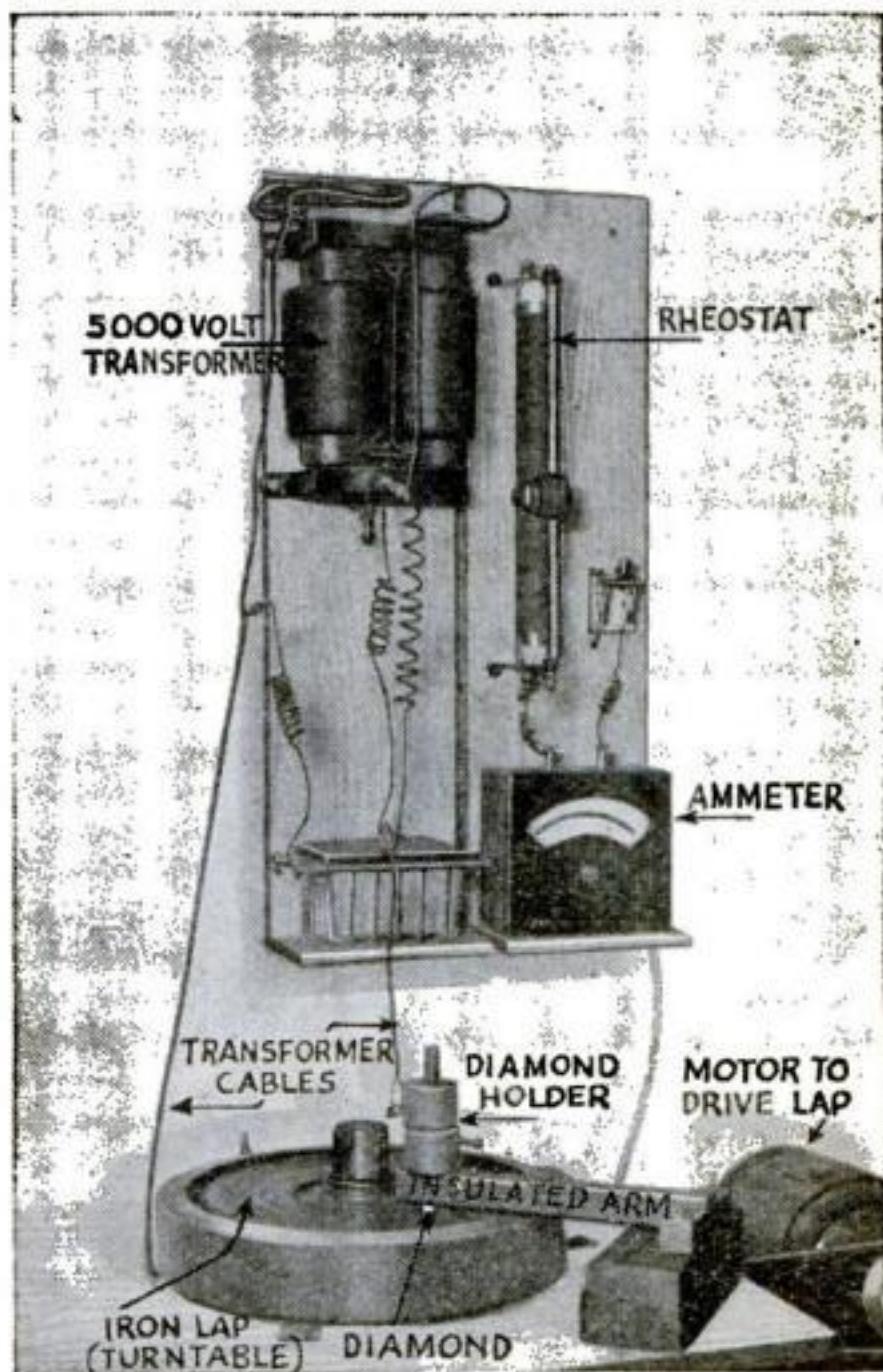
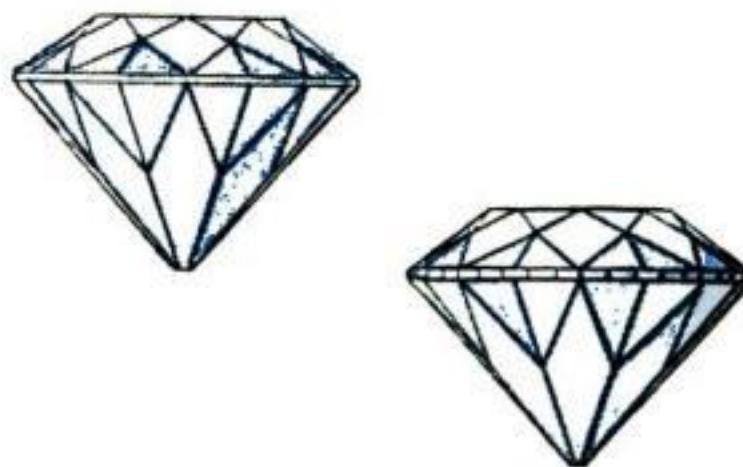
MULTI-FACET CUT diamond has the same fundamental design as the popular "brilliant" cut, shown mirrored at left, but 40 tiny facets are added to its girdle (above, right), thereby increasing the total to 98.

styles for as little as \$100. Only part of the extra expense is currently being passed on to the buyer, a poll of the makers shows.

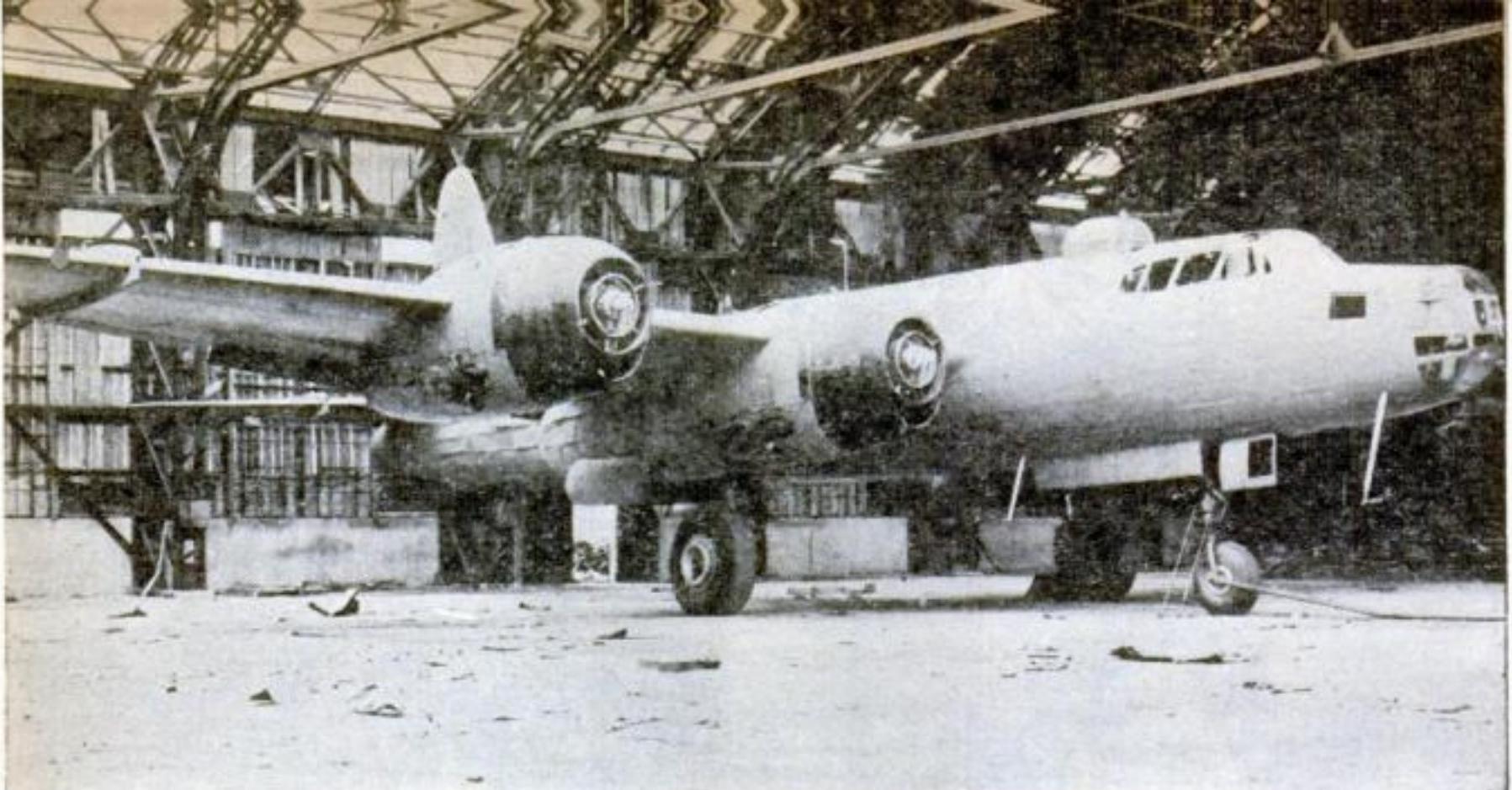
The National Bureau of Standards reports that recent experiments prove high-voltage electric current speeds up both the preparation of rough diamonds from the mine and the addition of the last delicate facets. Unless it is certain that a large rough diamond can be cleaved by a knife blow along an expertly-figured plane, the big stone is sawed into smaller ones, using a small circular saw rimmed with diamond dust. This takes time, and no short cut was known until Bureau of Standards experts tried applying electric current between the saw and the diamond. The saw then bit into the diamond with magical effect. Even cuts at angles called impossible with respect to the axis, or grain, of the stone became child's play.

Next, the scientists turned to the time-honored process of putting the smaller facets on the gem—holding it, soldered in a handling tool called a "dop," against a revolving turntable of cast iron coated with a viscous paste of diamond dust. This apparatus, the "lap," bears a striking resemblance to a crude phonograph. Now, the experimenters achieved even more spectacular success. When a bluish electric arc appeared at the contact of diamond and lap, difficult cutting jobs were speeded up from months to hours! The discovery may lower the cost of really fine diamonds.

MAGNA-CUT diamond, still more elaborate, requires exquisite care in the delicate finishing process that gives it an unprecedented 102 facets.



With this apparatus, experts have found that electricity greatly speeds the diamond-cutting process.



"Rita," new patrol bomber, had four turbo-supercharged engines, bad flight and cooling characteristics.

WHY JAP AIR FORCE DIED

U.S. Intelligence reveals errors, delays, lacks in design, development, production, pilot training that cost Nips control of sky

By PHILIP GUSTAFSON

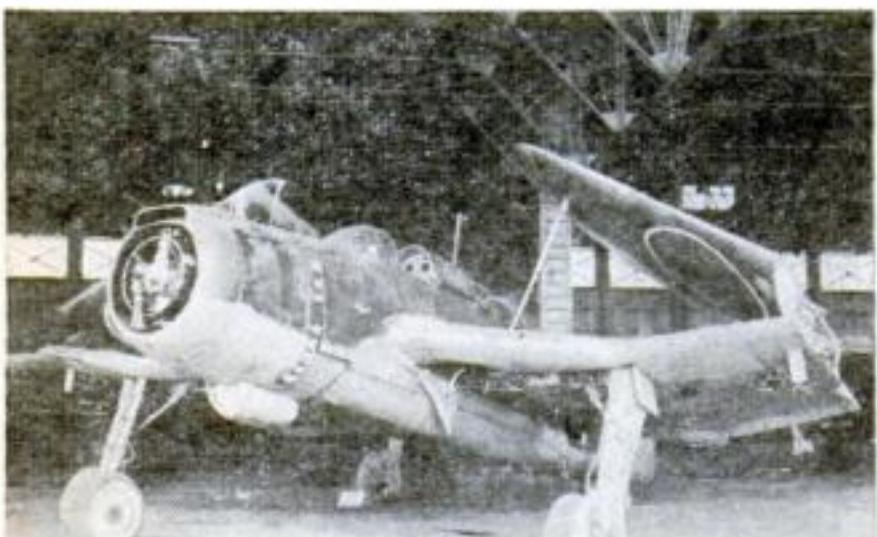
Lieutenant Commander, USNR

IN A last-minute frenzy to find something that would stop our B-29s from destroying her industries and keep our fleets away from her shores, Japan was feverishly pushing the development of jet propulsion aircraft when Hirohito ran up the white flag. Considering their late start, our air intelligence found, the Japs had made amazing progress. Yet, however well it was planned, this hastily-built equipment proved to have too many bugs. Given time, the Japs would

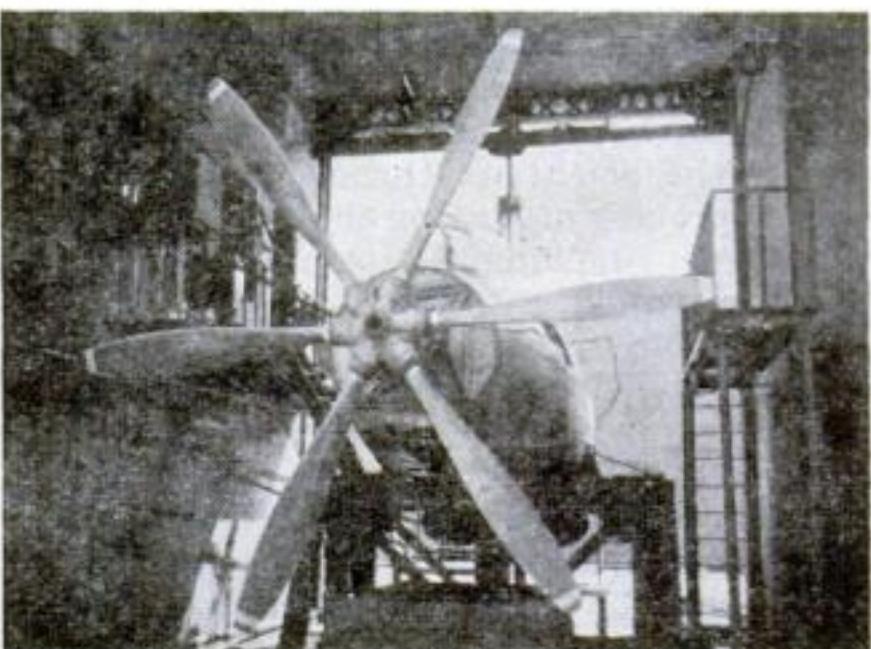
have eliminated them. But time ran out.

This was one of the discoveries made by our Technical Air Intelligence officers at the Yokosuka Naval Air Station, the Wright Field of Japanese naval aviation, as they checked up on the newest wrinkles in enemy aircraft.

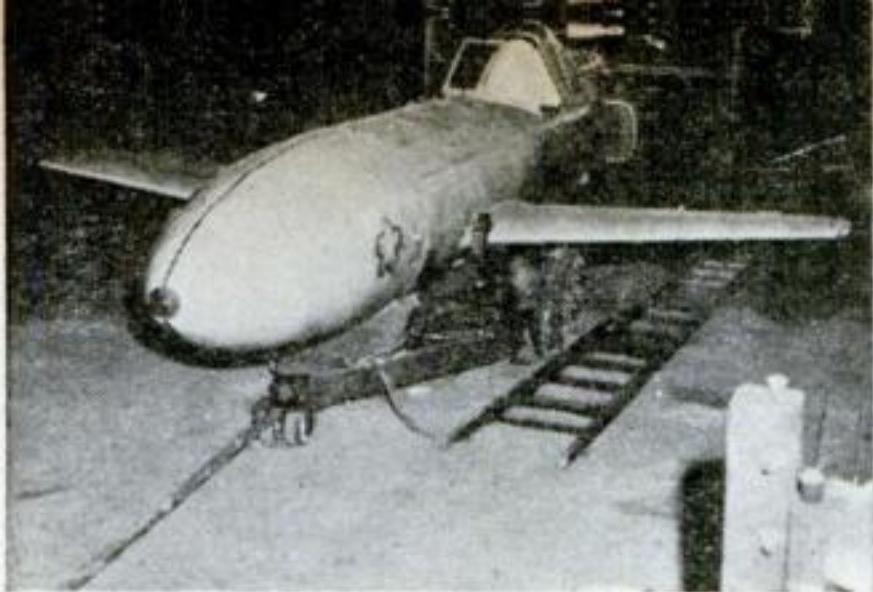
The Japanese aeronautical holy of holies was a straggling collection of thin-walled stucco buildings with flaking green-brown camouflage paint, flimsy hangars, and shabby aircraft parked every which way, some of them down on their knees from American strafing. On the surface, it



"Grace," monoplane with inverted gull wing, was fine torpedo bomber, with a 1,970-hp. Homare engine.



Keiun experimental fighter had six-bladed propeller, two engines behind pilot, and tricycle landing gear.



Baka 22, suicide plane, would have been deadly if the Japs had got enough of them in the air at a time.

wasn't much, but this was partly because there was so much beneath the surface: In the solid limestone of the Yokosuka hills were shops, hangars, storage and living quarters—a whole experimental aircraft factory underground.

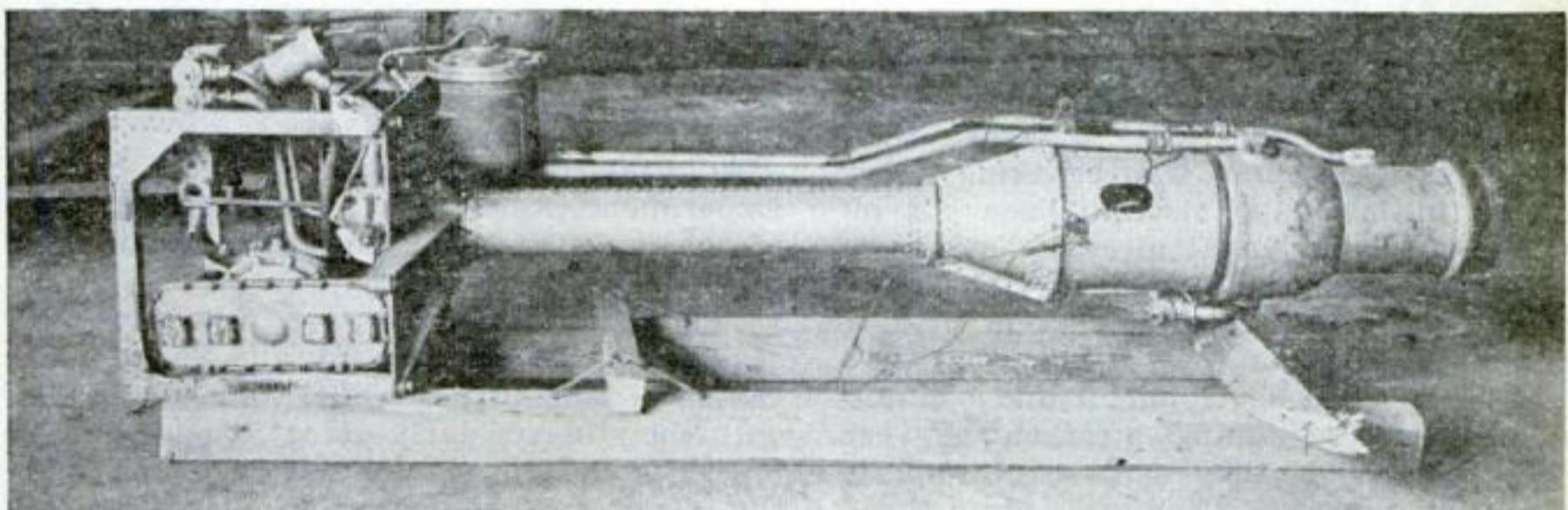
Inside the shops, however, were dirt and disorganization. Hand benches. Hand tools. The hammering out of little pieces. Scattered disorder. Everyone had apparently



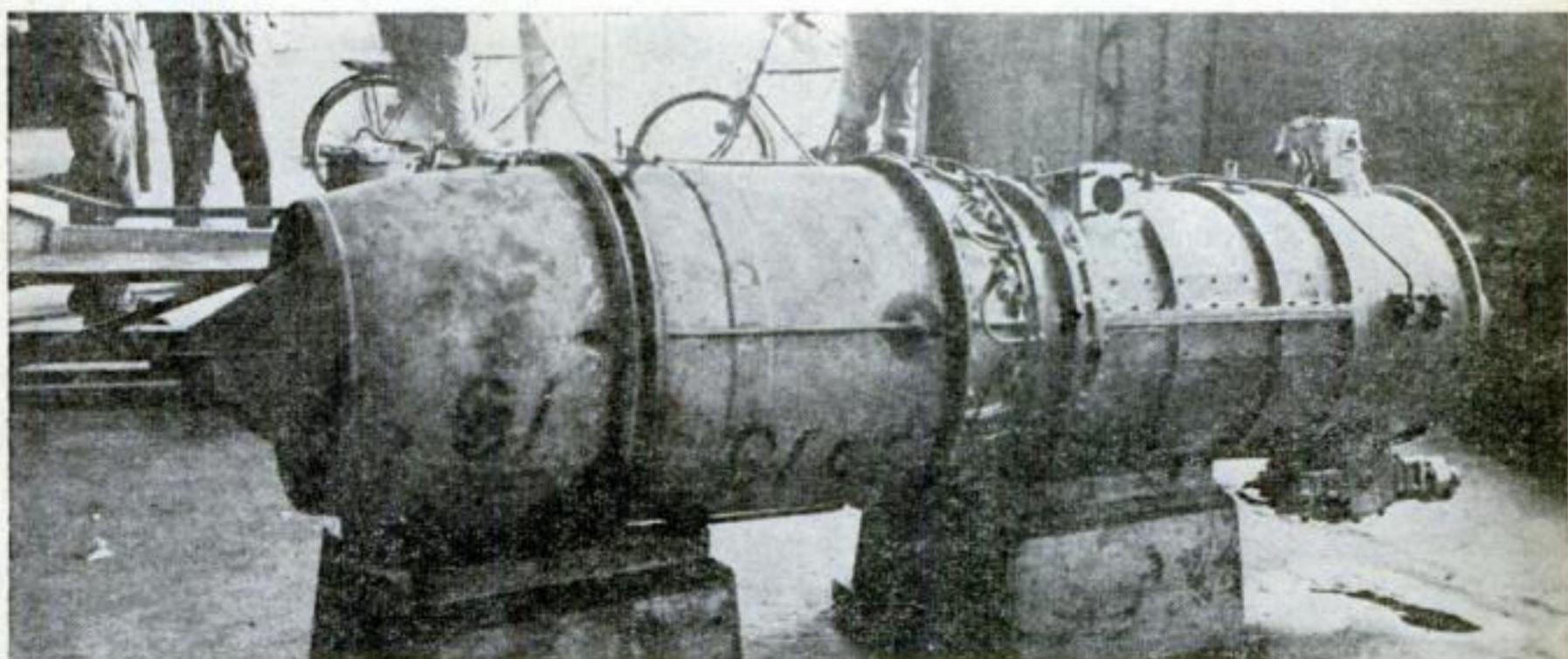
Jet exhaust of the Oka 22, a variation of the Baka. These tiny planes hit speeds of from 500 to 600 m.p.h.

worked in his own little messiness. There was no apparent clear flow of manpower effort.

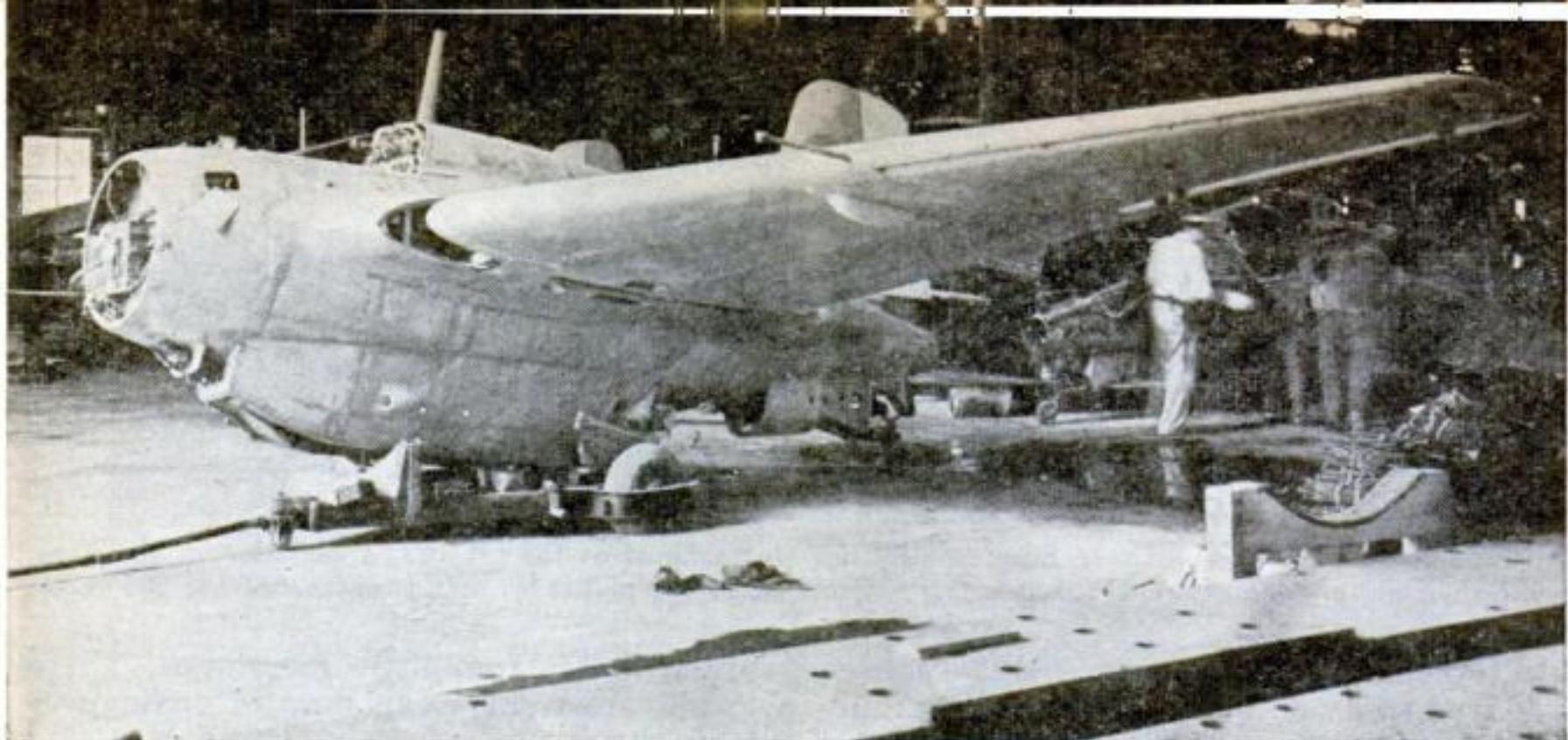
"This was one of the very things that licked them," said Lieut. George Hall, USNR, grizzled, untiring, and tart of humor, who with Ensign Jimmy Wisely, USNR, went ashore with the Marines on August 30, the day MacArthur put his wheels down at Atsuki. His intelligence unit, which in-



Bi-fuel, liquid-jet engine, intended for the Shusui interceptor (see page 90). Its fuel, T and C liquids, caused a chemical reaction in the combustion chamber that produced a high mass flow from the exhaust.



Axial-flow, turbo-jet engine, used in two types of Jap planes, developed temperatures too high for any alloy steel their metallurgists could produce. Consequently, its full potential thrust was never used.



The Shusui was to take off on wheels, drop them, land on a single skid. It climbed 10,000 ft. a minute.

cluded representatives of the U.S. Navy, Army, and the RAF, was still living in front-line conditions when I arrived, cooking their own food, washing their own clothes, and flailing at fleas that abounded in the enemy's naval barracks.

"To my mind, the Japs were beaten before the first atomic bomb hit Hiroshima," Hall told me. "Their industrial system had been all but destroyed by our B-29's, their transportation system was breaking down, and all initial materials had been cut off by our subs and naval aircraft—stocks of aviation gas were so pitifully low that they couldn't even operate their current models. In semi-desperation they turned to rocket and jet-propelled development and committed all their remaining aircraft—between 8,000 and 10,000, they said—to Kamikaze attacks on our fleet. The Japs were a third-rate nation playing out of their league and the suicidal emotional drive they were try-

ing to inject into their people would not make up for their own shortcomings in modern science and production."

This was the air force that four years before had challenged us to the heavyweight championship of the East and taken on the British on the side. And during the dark days of '42 its plagues of Zeros had come close to holding it. Then how did the mighty fall so low?

Admiral Hidao Tada, Chief of the Naval Experiment Station at Yokosuka, said one of the main reasons was the delay in replacing the Zero-type fighter.

"The high command was lulled into a sense of false security by the early successes of this plane, while your air force, with the sting of early defeat, began building on your Hellcat," he explained. "It was the Grumman Hellcat that beat Japan. When our high command did decide to put in mass production a plane to compete with



Tenrai, intended night fighter, had two 1970-hp. Homare engines, was planned to be one- or two-seater.

your F6F, it was too late. We ran into design and production troubles. Then material shortages. In the end, we couldn't get the new fighters out in quantity."

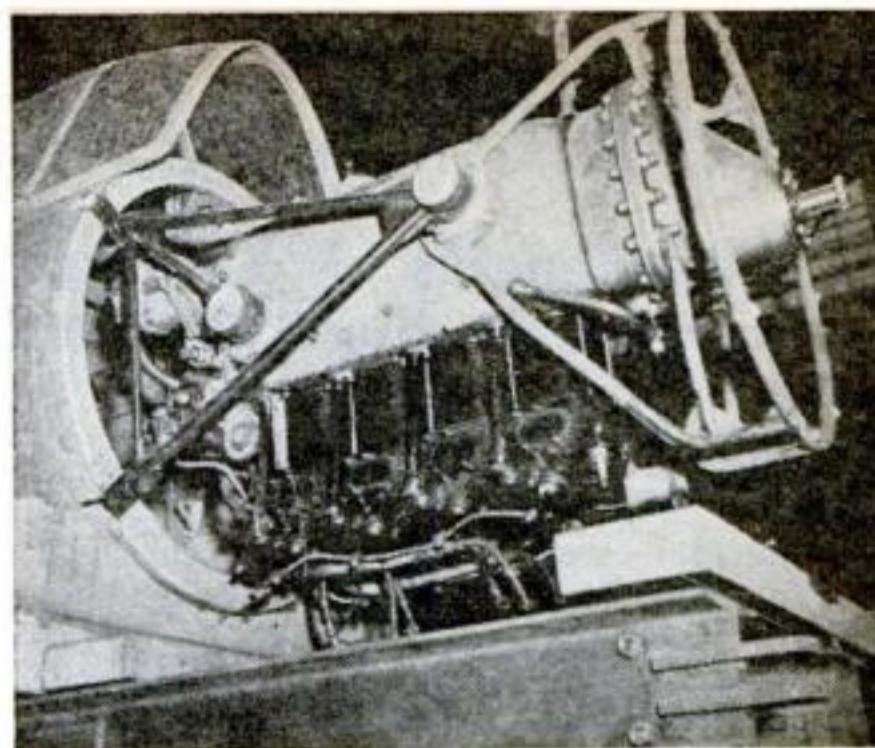
Commander Yukio Otsuki, one of the chief designers; Vice Admiral Misao Wada, Chief of the Air Service Bureau, the Japanese counterpart of our Bureau of Aeronautics; and Vice Admiral Munetaka Sakamaki, one of the Navy's chiefs of air operations, told me the same story. Some of them blamed the delay on the General Staff and some on the fliers in the field, who clung to the idea of maneuverability. Admiral Wada said he had offered plane designs three years before with better armor, self-sealing tanks, and firepower but he had been turned down.

The story of the belated fighter development, as gathered from these different sources and from the confiscated aircraft themselves, is this:

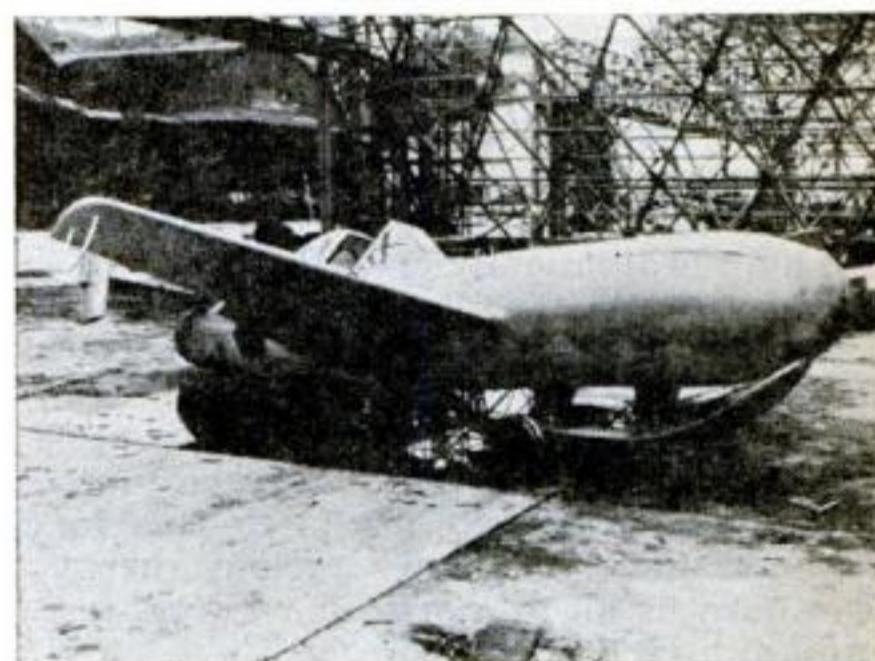
Finally convinced of the inadequacy of the Zero, the General Staff ordered its designer, the great Horikoshi, to produce out an up-to-date fighter. Horikoshi went to work on the Reppu (Strong Wind) which turned out to be a gentle breeze. The trouble came when the Jap engineers, cut off from the countries they had always copied, had to turn to and bring out engines of their own. This same shortage of creative engineering talent, incidentally, showed up in other fields and proved to be one of the basic factors in Japan's undoing.

The Homare engine was the white hope to power the Reppu but it ran into bugs and more bugs. The electrical system was a nest for some. The lubrication system bred others. All of the headaches added up to a year and a half's delay and during this time the designers turned to the 18-cylinder Kinsei. This 18-month delay was fatal. Otherwise, said Admiral Wada, the picture might have been different, for the new plane was more maneuverable than the Hellcat, had good protection and heavier guns.

While Horikoshi was sweating out the Reppu, Kawanishi came forward with a proposal to make a land fighter out of the float plane, Rex. The offer accepted, this plane was developed into the George 21. It was a good plane except that its aerodynamic characteristics were bad and the modification problems presented more difficulties than the hard-pressed Japs had time to contend with. They settled on mass production of the George 21—1,000 a month—but they overestimated their manufacturers, considering the problems of dispersal and material shortage that were then arising. The Japs say that if they had had the George 21 six months sooner, they would have discarded their other planes even to



Jet with an internal combustion engine, copied from Italian Campini, powered dangerous new Baka 22.



Pilots learned to launch and maneuver Baka planes in this trainer, Baka II. It had flaps but no power.

the old faithful Betty, and concentrated on this fighter.

As it was, when we walked in on the Japs we found their Navy with two good first-line interceptors in production—the George 21 and the Jack 34. With another six months to work the bugs out of George's landing gear and Jack's supercharger, Jap engineers would have brought these planes to the point where they spelled trouble for us. But for any change in the outcome it would still have been necessary to get the fighters into mass production, train pilots, and provide good maintenance. They were a good two years too late.

When their reconnaissance and air-raid warning system broke down, the Japs were wild for something that could get up in the air fast enough to stop the Allied bombers which were making a shambles of the home islands. It was then that, in their desperation, they turned the heat on jet propulsion.

They had reached the test model stage in a B-29 interceptor (*Continued on page 214*)

MAN-MADE SUNSHINE

Solar benefits of a fine summer day at the seashore now can be duplicated under lamp-filled glass ceiling

ALL the rays of sunshine at the seashore now can be delivered almost anywhere. Simulating sunlight requires only a few thousand foot-candles of ordinary light, but more invisible than visible rays are needed to synthesize sunshine. It has been done, however, with the rays of 423 lamps, of six types, in the new "sunshine ceiling." The lamps are standard types, but so many are needed that a "cloud" of glass and running water is necessary to carry off some of the heat.

Designed for hospitals or institutions requiring constant sunshine for plant research, the synthetic sunshine was demonstrated this winter at the General Electric laboratories in Nela Park, Cleveland.

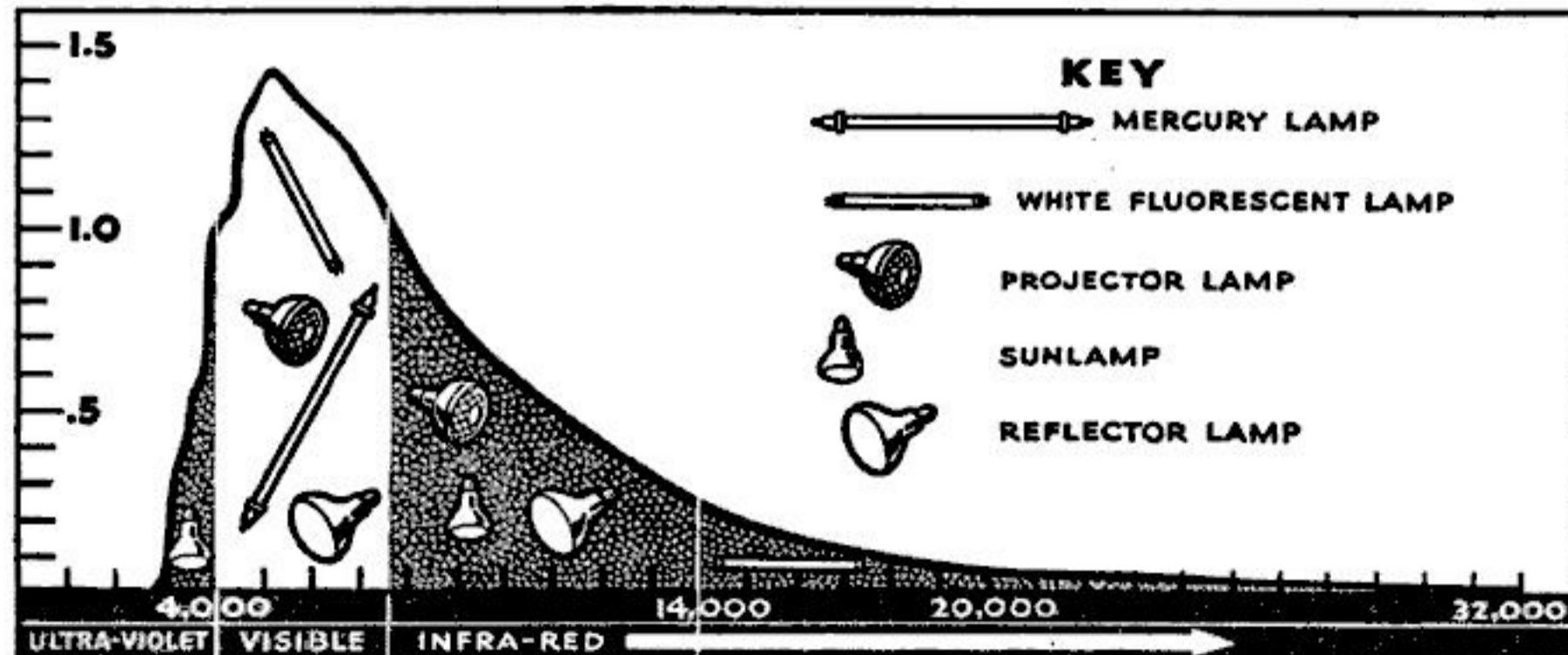
All light is atomic. By breaking the hearts of atoms, the sun emits so much radiant energy that it sometimes exerts nearly 100,000 tons of pressure on the earth. The explosion of an atomic bomb probably produces even more light than would be found on the sun's surface, but it is emitted for only an instant. The sun's radiant energy would burn us all to a crisp if we were not protected by the atmosphere.

More than half of this energy is infra-red rays, which we feel as heat, and about a twentieth of it is ultraviolet rays, which include those with germicidal effects and those that tan us. We see by means of rays between these two extremes. The oxygen,

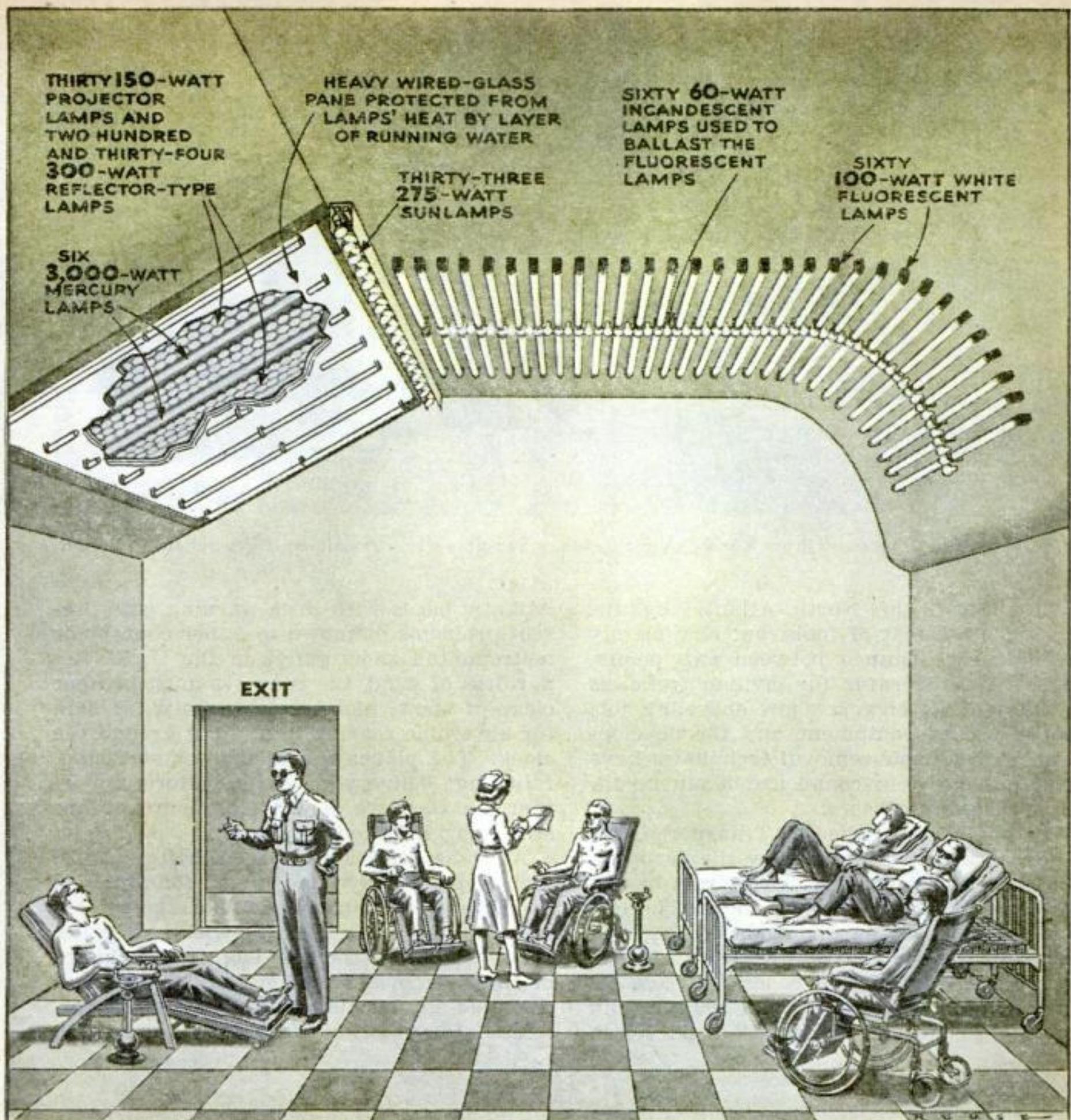
carbon dioxide, and moisture in the air absorb various amounts of these various rays. Sunshine, moreover, varies according to the season and latitude, and from day to day. To simulate sunshine, therefore, the scientific artists had to choose a day as their model. They chose a nice summer day at the seashore.

Dr. Matthew Luckiesh computed the amount of each kind of radiant energy that would reach a bather on such a day. G. F. Prideaux and other engineers then determined the kinds and numbers of lamps that would be needed to synthesize sunshine. At power rates, the 423 lamps they selected could be lighted for 24 hours for about \$32, but the heat from such a battery of lamps would be too great for comfort.

So the engineers placed the fluorescent lamps and sunlamps in one side of the ceiling of a room 28 by 14½ feet, and concealed the others behind a wire-glass skylight, over which they could keep water running. The smooth side of the glass skylight was placed toward the lamps at first, but the water running over it did not distribute itself evenly enough and the heat broke the glass. This difficulty was overcome by turning the hammered, or roughened, side of the glass toward the lamps. Then, by running a stream of 1,000 gallons of water an hour over the skylight, and supplementing this cooling system with electric fans, they found



Mountain of light shows how sun's radiant energy, in watts per sq. ft. per 100 Angstroms (on the vertical scale), is distributed to summer bathers and how it is duplicated by lamps. An Angstrom unit, one ten-millionth of a millimeter, measures wave lengths of sun's rays (horizontal scale). Waves of sun's rays vary in length from 3,000 to 30,000 Angstroms, but only those 4,000 to 7,600 Angstroms long are visible.



Indoor sunshine all the year around can now be obtained where needed by means of the installation diagrammed here. It is as hard to look at as the sun, but as enjoyable and beneficial as basking on a beach.

that excess heat could easily be carried off.

Further research may make it possible to synthesize sunshine with fewer, more efficient lamps. The invisible infra-red and ultraviolet rays are no more difficult to produce than visible rays. In fact, they sometimes get in the lighting engineers' way. Ultraviolet rays are produced first in a fluorescent lamp and changed in wavelength to produce visible light.

The efficiency of electric lights is measured in lumens—one lumen being the amount of light that would fall on each square foot of a sphere with a radius of one foot, when placed around a light with the power of one candle. The highest possible

efficiency at which white light can be produced, according to Dr. Luckiesh, is about 200 lumens per watt. Fluorescent lamps now in use produce from 30 to 40 lumens per watt, and engineers are now confident that such lamps will be made even more efficient in the future.

"Considering these and the high-pressure mercury arcs," says Dr. Luckiesh, "we may soon have 100 lumens per watt. These lamps will make it easier to produce the levels of illumination that science has shown to be ideal for maximum human efficiency, safety, comfort, and welfare." Meanwhile, "summer sunshine" can readily be obtained wherever needed with the lamps now available.

SNOW SHOVELING

Army methods keep transatlantic air lanes open



As a Douglas C-47 takes off from a snow-cleaned area, a Sno-go eats up remaining drifts between runways.

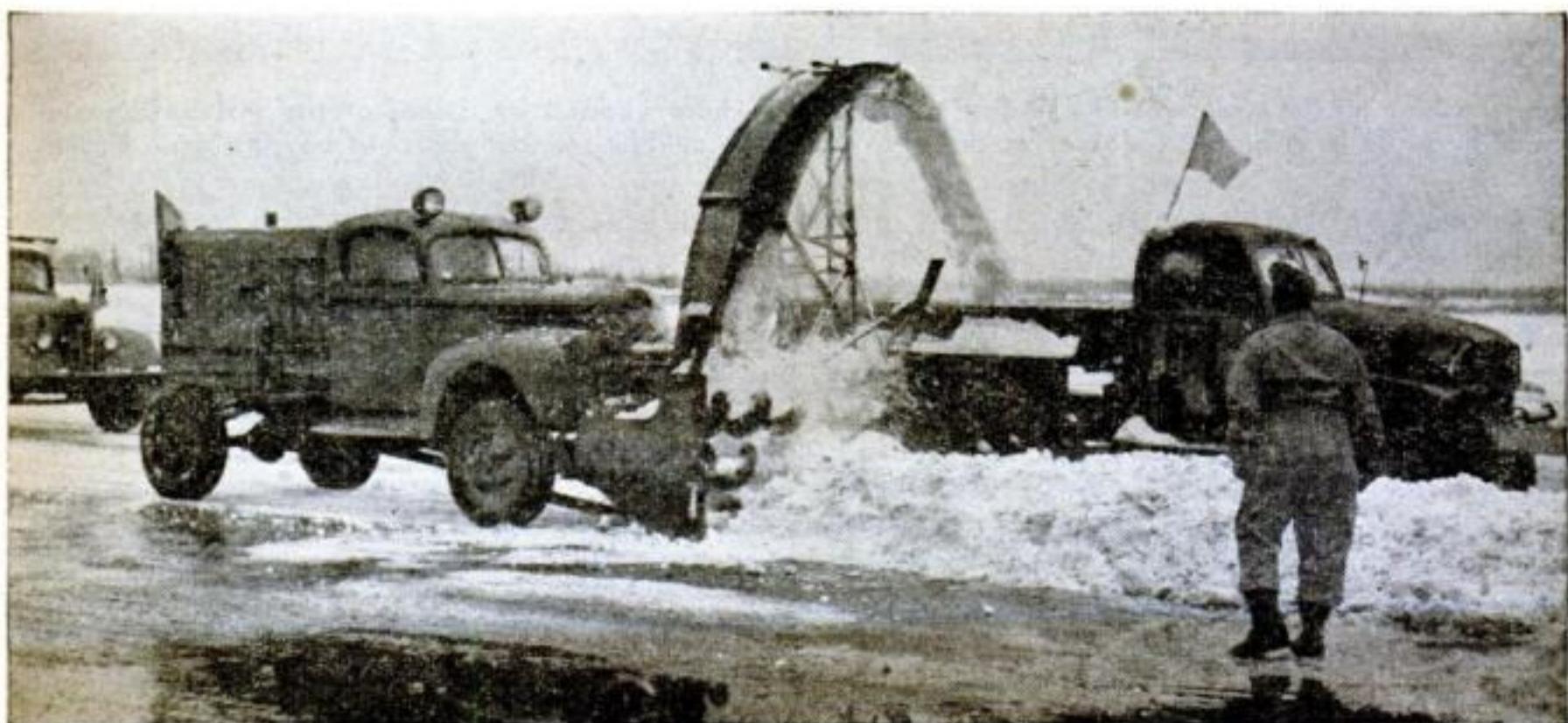
CROSSING the North Atlantic by air, once the feat of fools, but now merely the quickest distance between two points, has been made safer for civilian travelers by the world's biggest snow shoveling job. Proper use of equipment and the development of new snow-removal techniques have made possible year-round use of our northern transatlantic bases.

The engineers of the Air Transport Command learned their know-how the hard and cold way, when our tactical aircraft had to use these bases, snow or no snow. The lessons are now paying dividends literally—in cash—for the commercial operators who are using these war-built air bases.

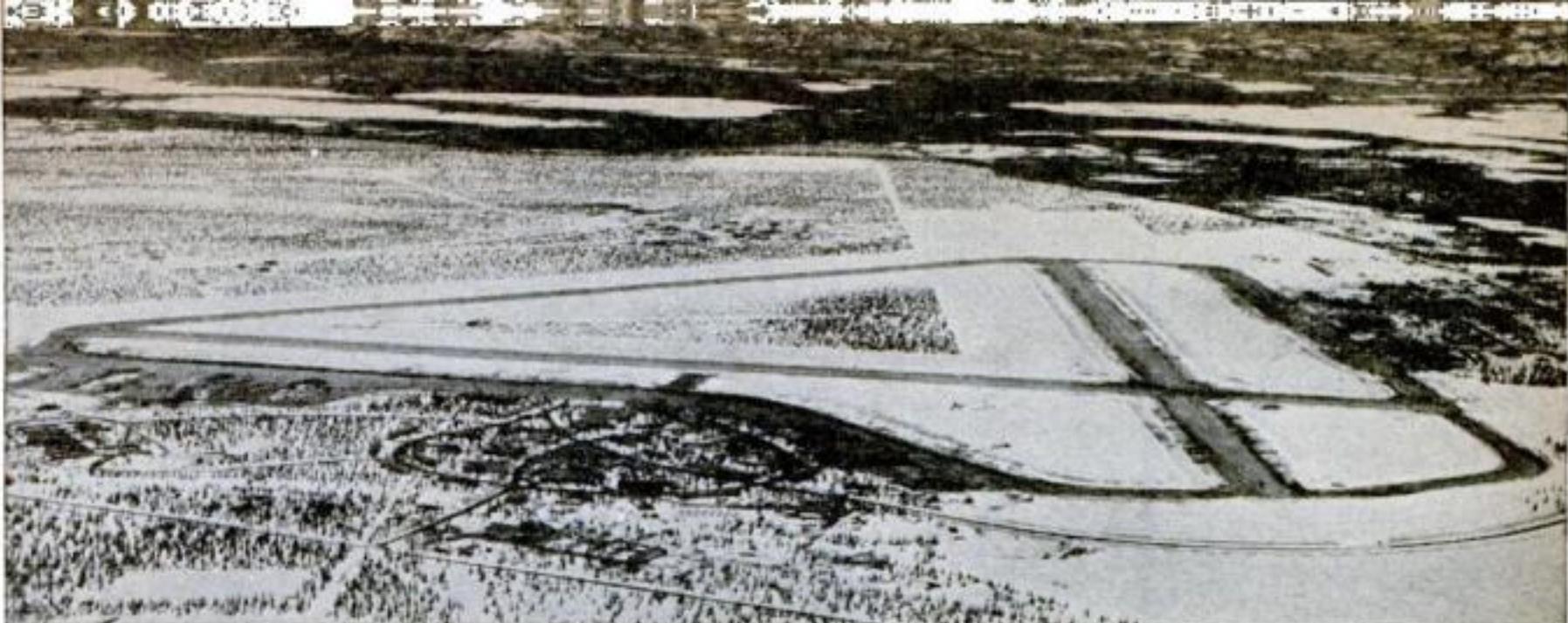
With winds often more than 100 miles an hour, "horizontal snow storms" strike North

Atlantic bases with little warning, and present problems unknown to either country or metropolitan snow gangs in the U. S. Regardless of wind, the runways must be kept clear of snow, and icy surfaces made safe for air traffic roaring in and out around the clock. The planes must land for servicing, refueling, delivery of cargo. More important, for the care of wounded men who are still being returned by air.

At some bases I have seen drifts over 20 feet deep, and have had to yell for four GIs to help me open an outside door against 50-mile-an-hour gusts. Coming with such gales, snow presents to the base engineer in charge of snow removal an enemy as dangerous in peace as any encountered in actual combat. Arctic storms are sudden. Often a gale will



Equipped with a loading scoop to direct the flow of snow, this type of snow-eater fills a moving truck.



This ATC base for the North Atlantic Division has three 6,000-foot runways that must be kept clear of snow.

bring a white wall of snow so thick and smothering that trucks, tractors, and other outside equipment are completely buried before they can be readied for action. An arctic storm can also be capricious. It may reverse direction and uncover these same trucks in a matter of minutes and sweep its own snow off the runways right down to the bare concrete.

This changeability of the wind is an obstacle to safe snow removal at many bases. For example, planes are due in two hours; a storm is raging; all equipment is working at top speed to clear the upwind runway. Thousands of square yards of runway have been pretty well cleared in the two hours, and the exhausted snow crews are listening for the motors overhead. Just as the planes are beginning to let down for the field, still several miles away, the wind shifts. Instantly, two hours of work are lost, for the planes *must* land upwind, and the runway that is now upwind is not usable. The crews and equipment must switch to the new upwind runway and open the second runway while the planes circle anxiously.

It was in this tough school that engineers of the North Atlantic Division of the Air Transport Command devised the methods of clearing runways and taxi strips that keep the ports open.

A combination of equipment is used. First, angle plows or scrapers move down the center of the runway, clearing a path the entire length. Behind them come other angle plows or scrapers moving the snow still farther back in mounting windrows. These 10-foot scrapings soon pile up into ridges that this equipment cannot budge. Then the Sno-go equipment enters the battle, moving down the runway in the wake of the angle plows and scrapers.

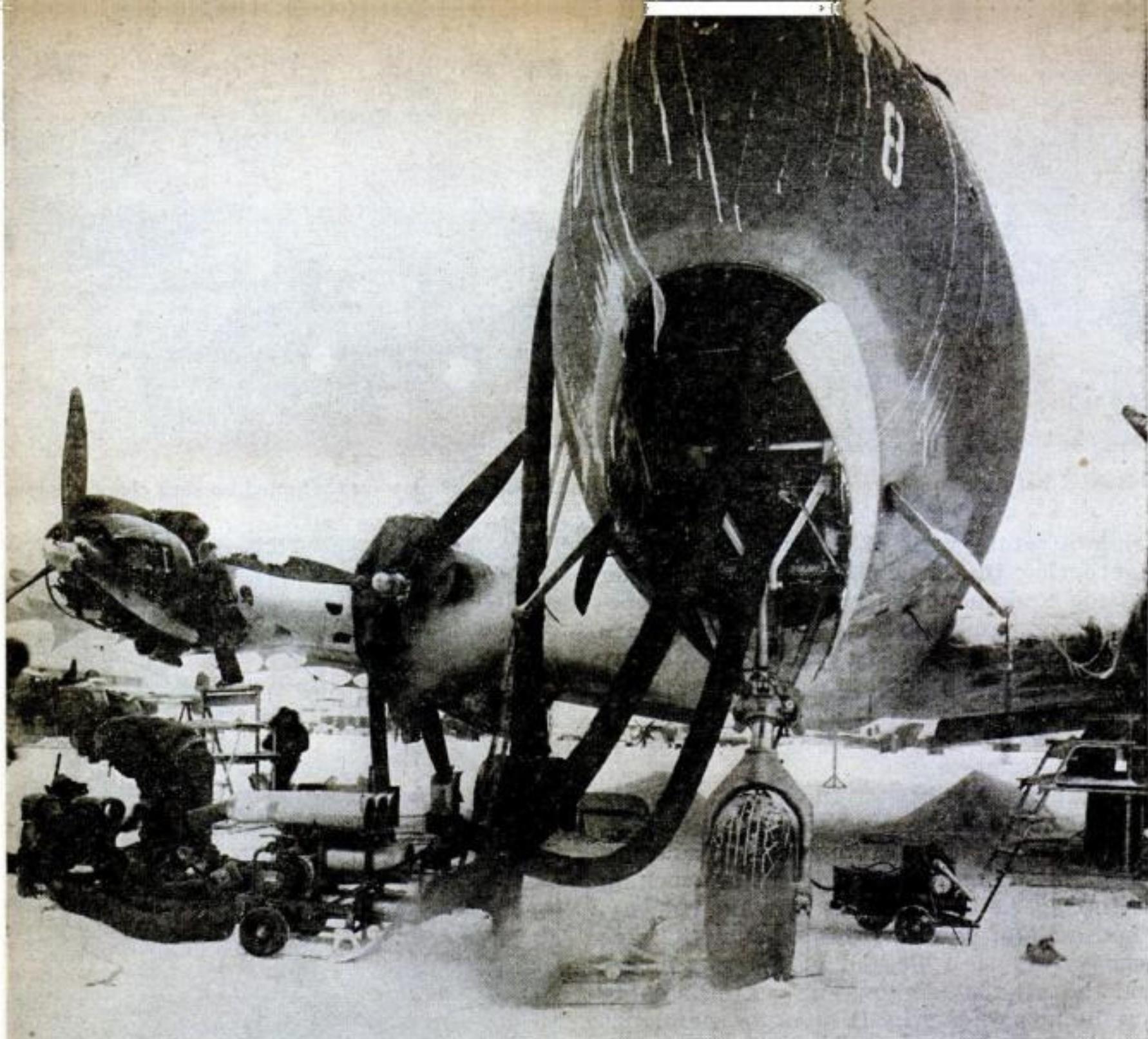
These giant self-propelled units are a combination of several devices in a single snow-eating machine. Whirling corkscrew blades on the front of the machine tear into the hard-packed windrows of snow, drawing the



Four feet of snow on the level is an average fall for arctic bases. Long-handled shovel shows depth.



Beneath this drift, crossed by the shadow of a telephone pole, lie trucks that must be shoveled out.



This Douglas C-54 of the ATC is being serviced in high winds and zero weather. Hoses pump hot air into ship to make interior bearable for workmen. Work areas around it are cleared of snow by men with shovels.

mass into a center maw where it is fed into a whirling vertical fan that hurls the snow 200 feet to one side.

This spreads the snow out, breaking down the windrows and dispersing them in a fine shower over the unplowed part of the area. By this time the scrapers and angle plows are back at the start again, pushing the snow farther back; then the process is repeated. The snow must be cleaned far beyond the edges of the runways, for high drifts and piles along the edges would endanger wing tips and cut down the usable width of the strip.

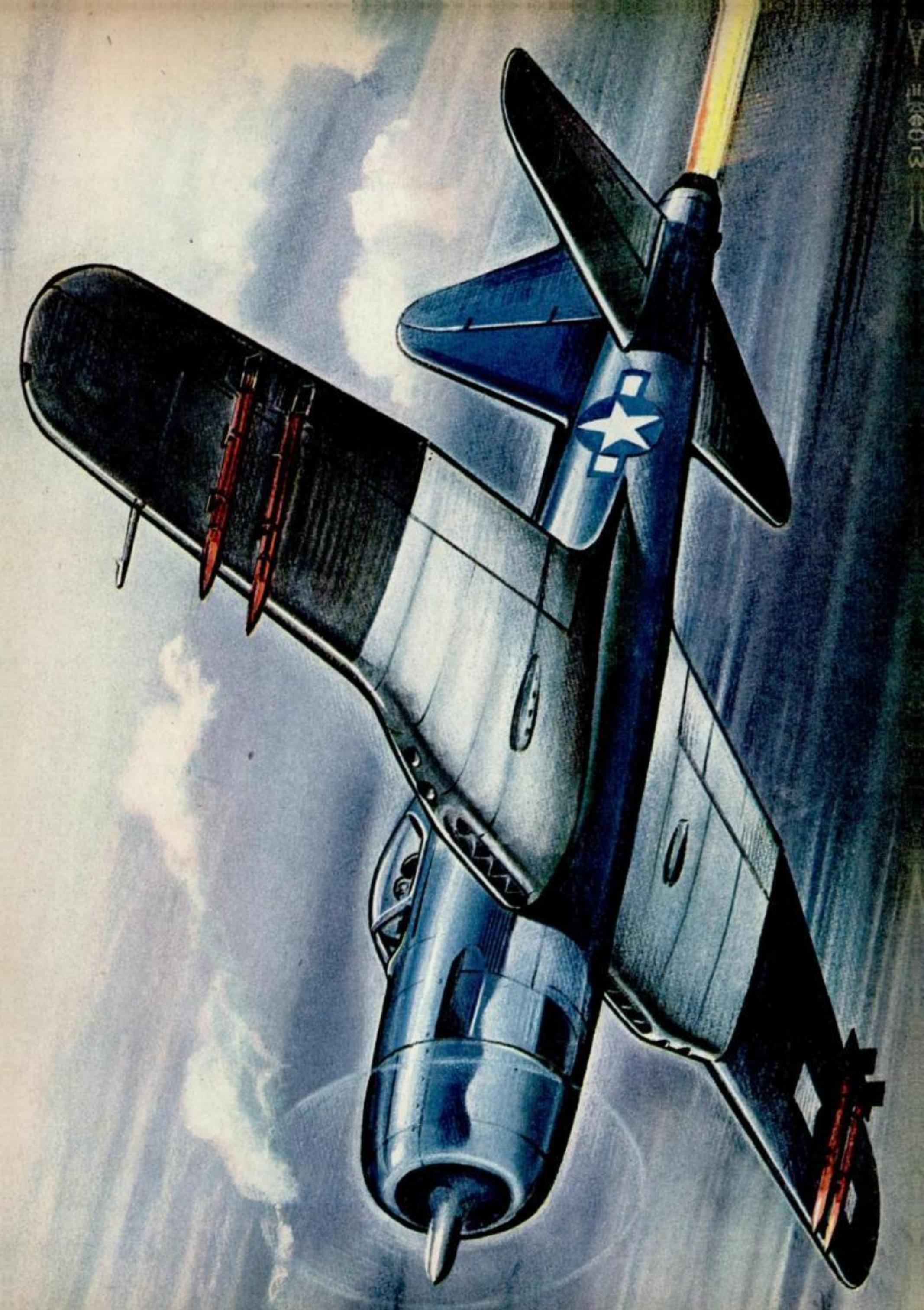
Runway boundary lights also must be uncovered. This is usually done by hand to prevent damage to glass reflectors and equipment. Tall painted poles are used to

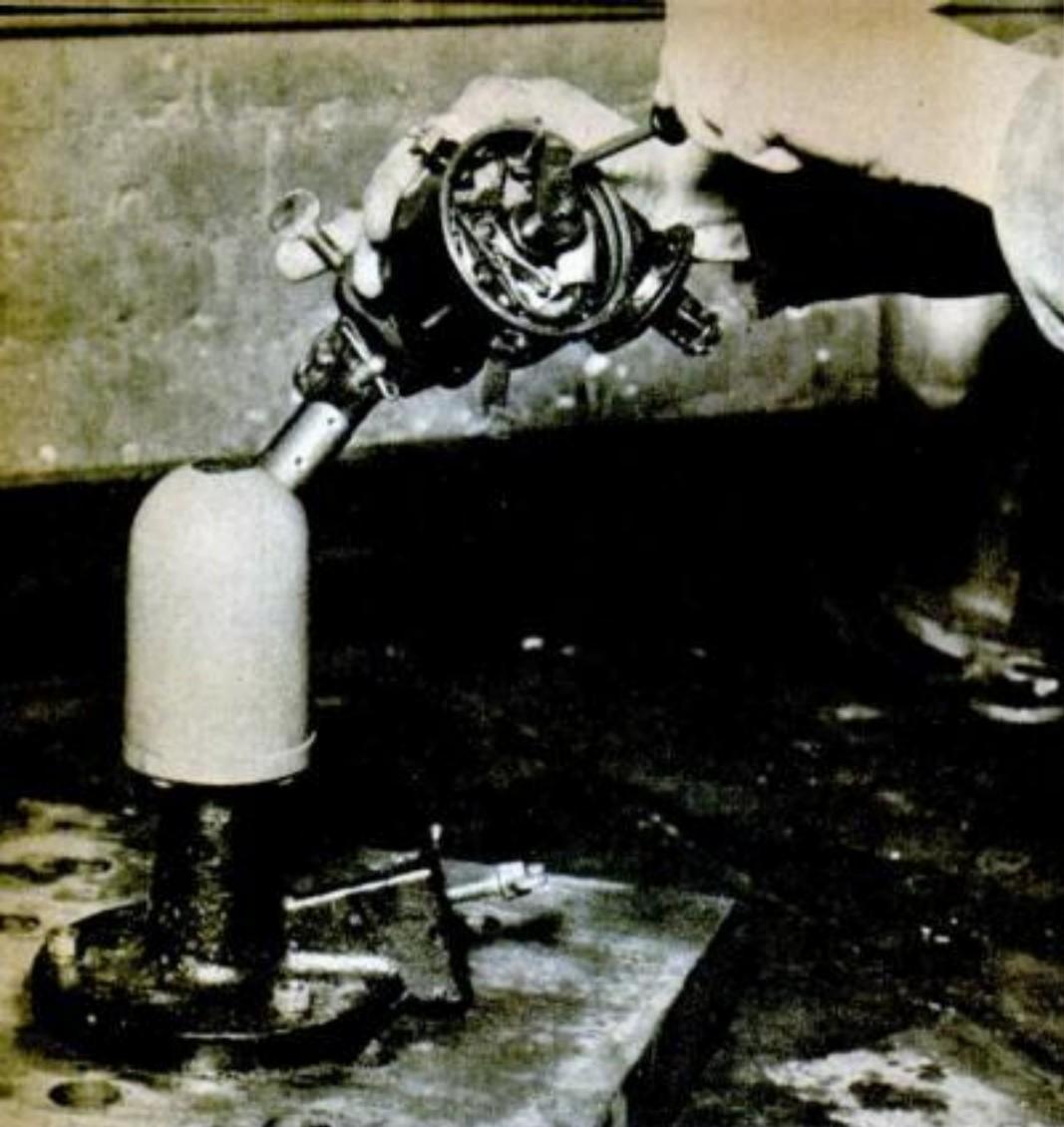
mark the lights as soon as winter approaches, for sudden early-season storms might catch the snow-removal gang unprepared, and valuable time would be lost fishing for the lights in the giant drifts. Taxi strips and hangar aprons are cleared with the scrapers, angle plows, and "V" plows that have blades seven feet high and auxiliary blades that make them even higher. Much of the work about the hangars, on fuel tanks, pumps, and service areas, however, must be done with the old reliable hand shovel to save these installations from injury by the ponderous mechanized snow equipment.

Snow plowing begins before the snow starts piling up, to keep ahead of it, but when gales reach (*Continued on page 222*)

RYAN FIREBALL—U. S. NAVY'S FIRST JET FIGHTER. First plane in the world to combine jet and reciprocating power plants, the Fireball has a 1,350-horsepower Wright Cyclone engine in the nose that does the pulling while a General Electric I-16 jet job in the fuselage boosts it from the rear. But the ship can streak along on either power plant alone—at 320 m.p.h. with the front engine and 300 m.p.h. with the jet unit. With both engines operating at full power it can climb at a mile-a-minute clip. The Fireball's armament consists of four .50 caliber machine guns, each fed by 300 rounds of ammunition. Also, two 1,000-pound bombs and racks for eight rockets may be installed under the plane's wings.

Your Pin-Up





Work Held in Hydraulic Positioner Is Always Right Side Up

You tackle your task with both hands when a PowrArm holds your work. A mere twist of the hydraulic-pressure lock nut firmly locks the head and arm in any position desired. The head may be turned in a complete circle horizontally, and the arm, working on a ball and socket under hydraulic

pressure, may be moved in a 90-degree arc from horizontal to vertical. Adapters for holding work, such as the one clamped on the arm in the picture above, right, are removable, and special adapters are easily attached. The Garfield Engineering Co., Wichita, Kans., is the manufacturer.



One-Handed Wrench Has Ton of Gripping Power

DESIGNED for one-hand operation and having more than a ton of gripping power in its steel jaws, the wrench on the left is as easy to use as a pair of pliers. The nut in the center regulates the width of the jaw opening. A red Tenite handle insert adds color to this product of the Botnik Motor Corp., Binghamton, N. Y.



Tumble-Latch Jig Speeds Operation on Drill Jobs

SPEED and precision in doing mass-production drill jobs are assured with the aluminum-alloy jig put out by the Oscar W. Hedstrom Corp., of Chicago. A tumble-spring-controlled latch aids in the fast operation, and locating pins and an adjustable clamping screw contribute to the exactness achieved in drilling the workpieces.



I'D LIKE TO SEE THEM MAKE...

Everybody has his own pet idea of some gadget he would like to see in general use. What is YOURS? Popular Science Monthly will pay five dollars for every such suggestion published.

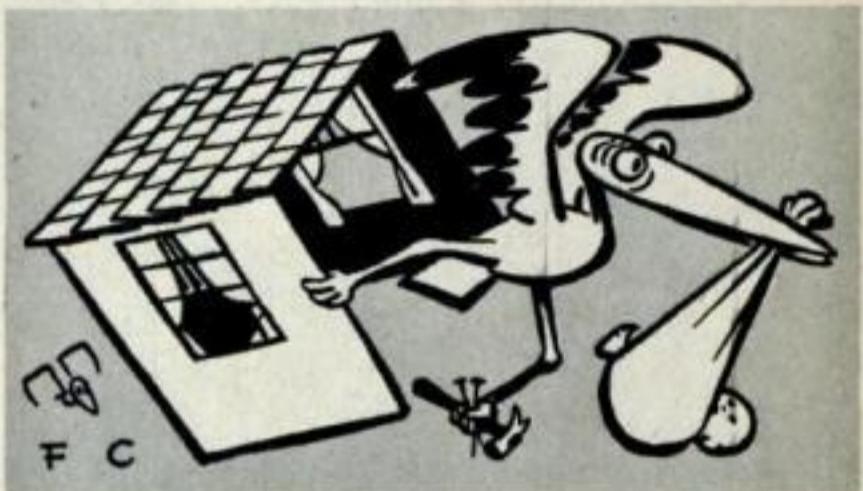
"FITTED" BED, with spring strength proportioned to the weight of the prospective sleeper. Springs should also be adapted to the weight of the various parts of the body, so that the user will naturally lie in the correct position.



HUM-FREE ELECTRIC FAN. It's hard enough to sleep on a hot night, without a noisy fan. Much progress has been made in reducing fan-motor noise, but nothing less than absolute silence will do.



WRIST-WATCH ALARM. So you have trouble getting up in the morning? What you need is a wrist watch with an alarm in the form of a pin that will give you a jab when it's time to pry yourself loose from the mattress. For persistent dozers-off, a repeat action can be added to keep up the prodding until the desired effect is produced. Especially recommended for people who simply ignore alarm clocks. Some bright inventor has probably patented this idea already. Let's have it!

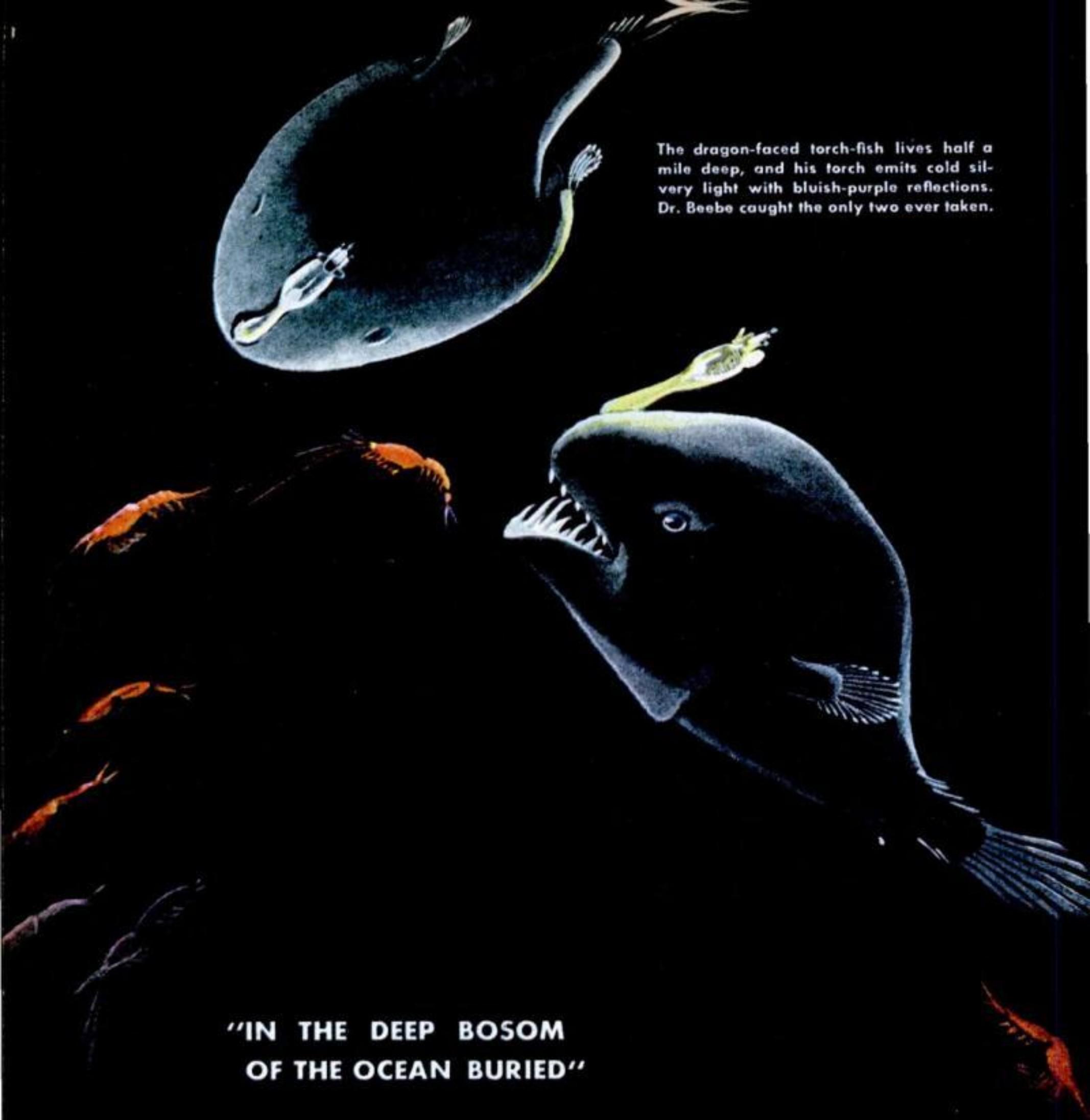


STRETCHABLE HOME. House plans for young couples should provide for the *planned* addition of more rooms as the family grows. Thus, young couples could start out with homes suited to their actual needs, instead of fettering themselves with debt for space they won't use right away.



CONVERTIBLE TABLE-CHAIR would be a space saver for apartment dwellers. The table top could be pivoted to swing over the back of a comfortable armchair, after the manner of Junior's high chair.





The dragon-faced torch-fish lives half a mile deep, and his torch emits cold silvery light with bluish-purple reflections. Dr. Beebe caught the only two ever taken.

'IN THE DEEP BOSOM
OF THE OCEAN BURIED'

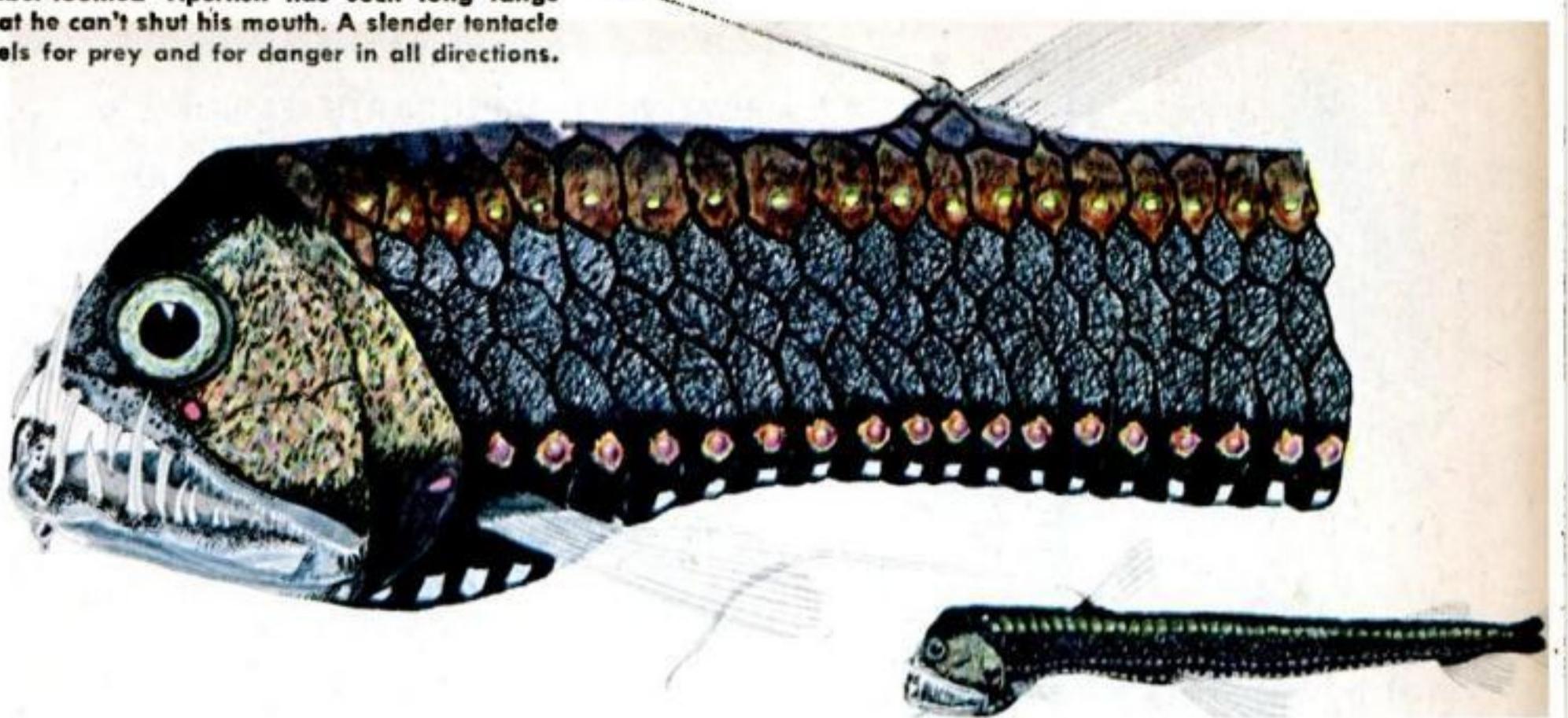
STRANGE FISH FOUND AT GREAT DEPTHS

Dr. William Beebe, Undersea Expert, Brings 'Em Back—but Not Alive

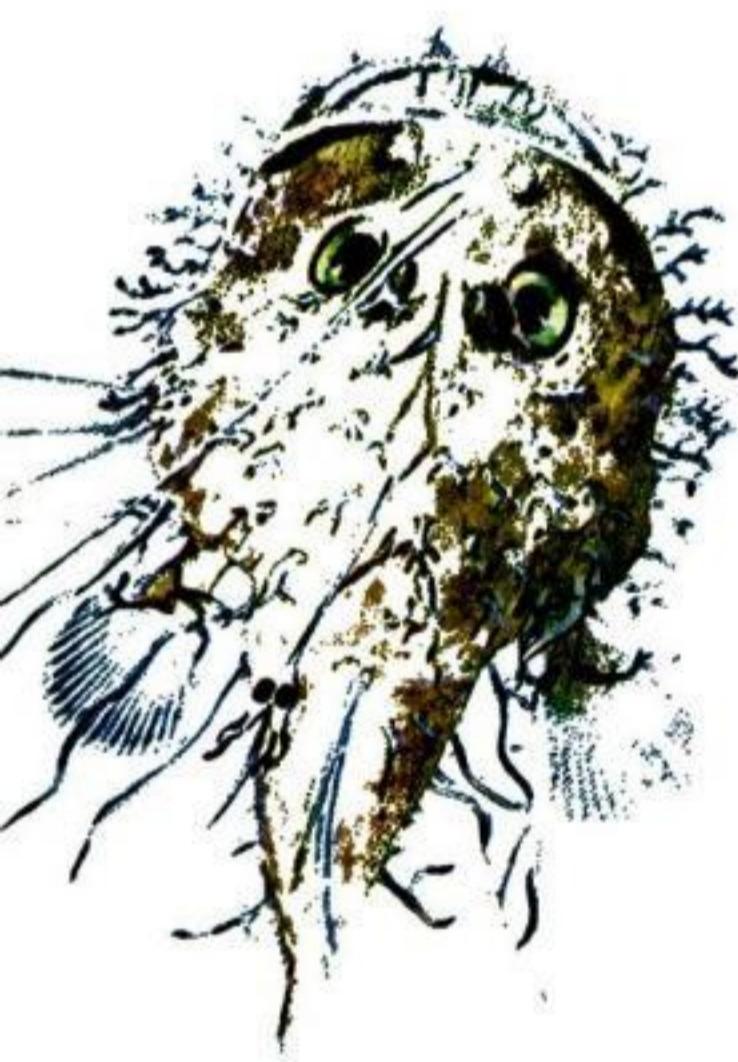
THESE hitherto unpublished pictures had to be sketched by artists at top speed to catch the true colors while the creatures were still alive. Since the fish are netted far below the surface off Bermuda, many do not live more than 10 minutes after de-

pressurization at sea level. They are brought up in a silk bolting-cloth net about 30 feet long and three feet across. They are immediately placed in an aquarium filled with ice-cold salt water, and the artist gets busy recording their strange shapes and colors.

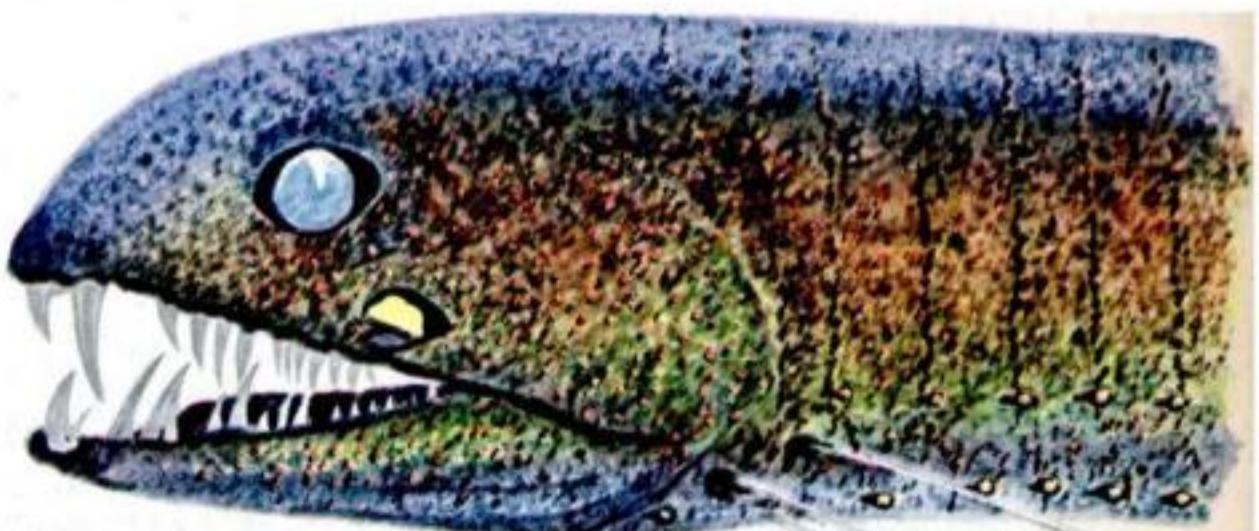
Saber-toothed viperfish has such long fangs that he can't shut his mouth. A slender tentacle feels for prey and for danger in all directions.



There's no name yet for this yellow-green angler fish with an enormous mouth always ready to engulf the prey attracted by its luminous lure. Tentacle-covered skin warns of any movement in the water surrounding it.



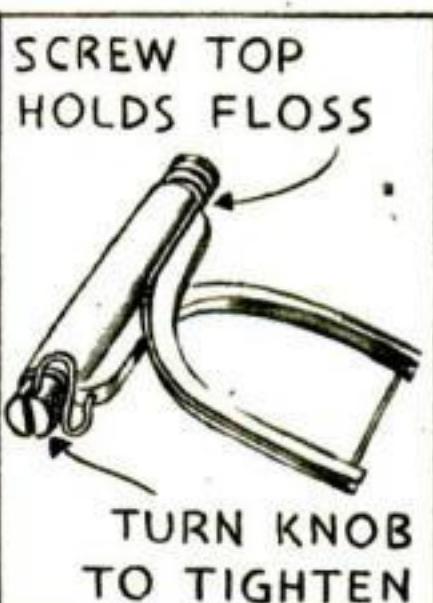
Scientific name means "metallic lover of the deep." A mile down its colored lights glisten with tremendous power. It feeds on fish almost as big as itself and uses its fins as feelers.



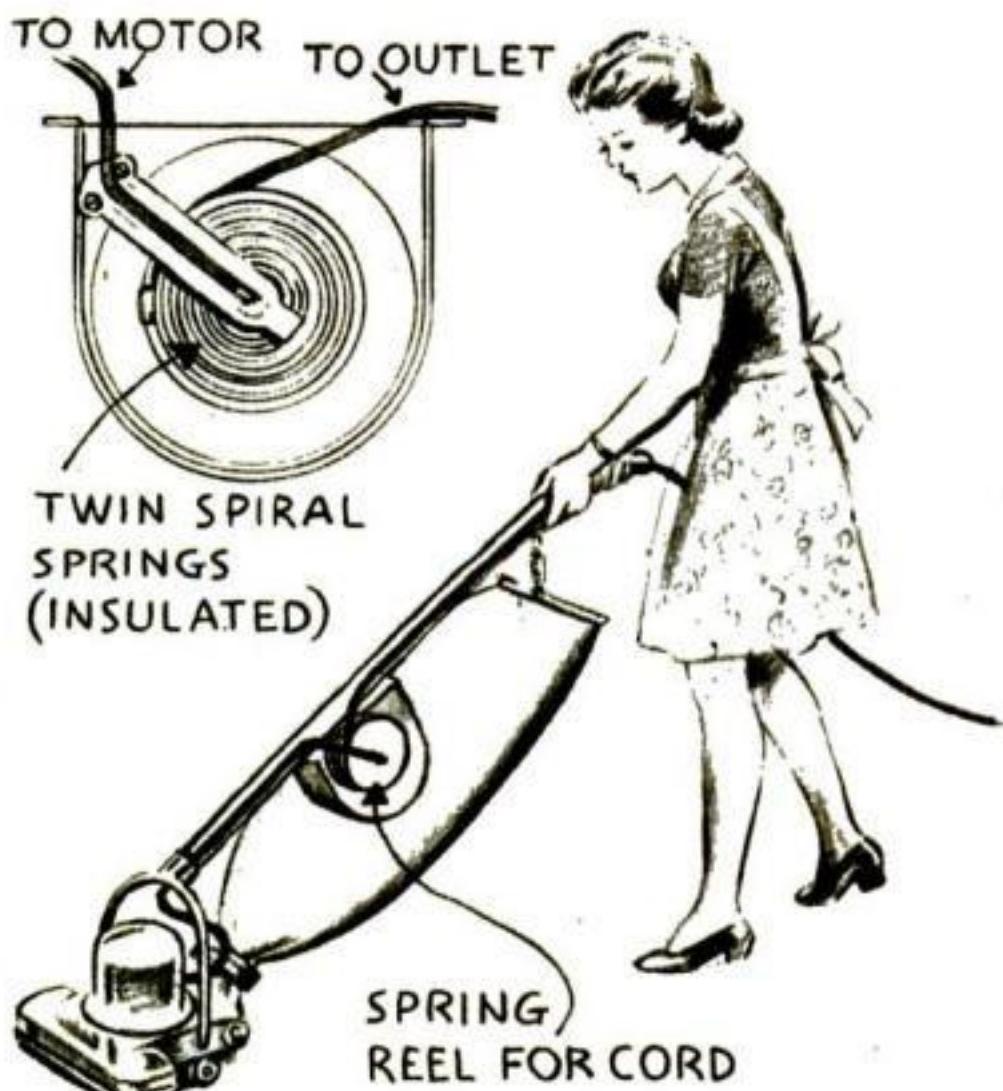
Paintings by Elsa Bostelmann
and Helen Tee-Van from
New York Zoological Society



NEW IDEAS FROM



YOU WON'T TRIP on the electric cord of your vacuum cleaner, nor will the cord become snagged around legs of furniture, if the cleaner is provided with a reel that feeds out cord through the hollow handle as you move away from the outlet. The cord automatically winds back on the reel unless braked by a control button on the upper end of the handle. Devised by Donald H. Reeves, of Dayton, Ohio, the reel does not increase the size of the cleaner because it is mounted on the underside of the handle, with the dust bag specially fitted to cover it. In fact, less space is required for storage since the hooks for holding the cord are eliminated.



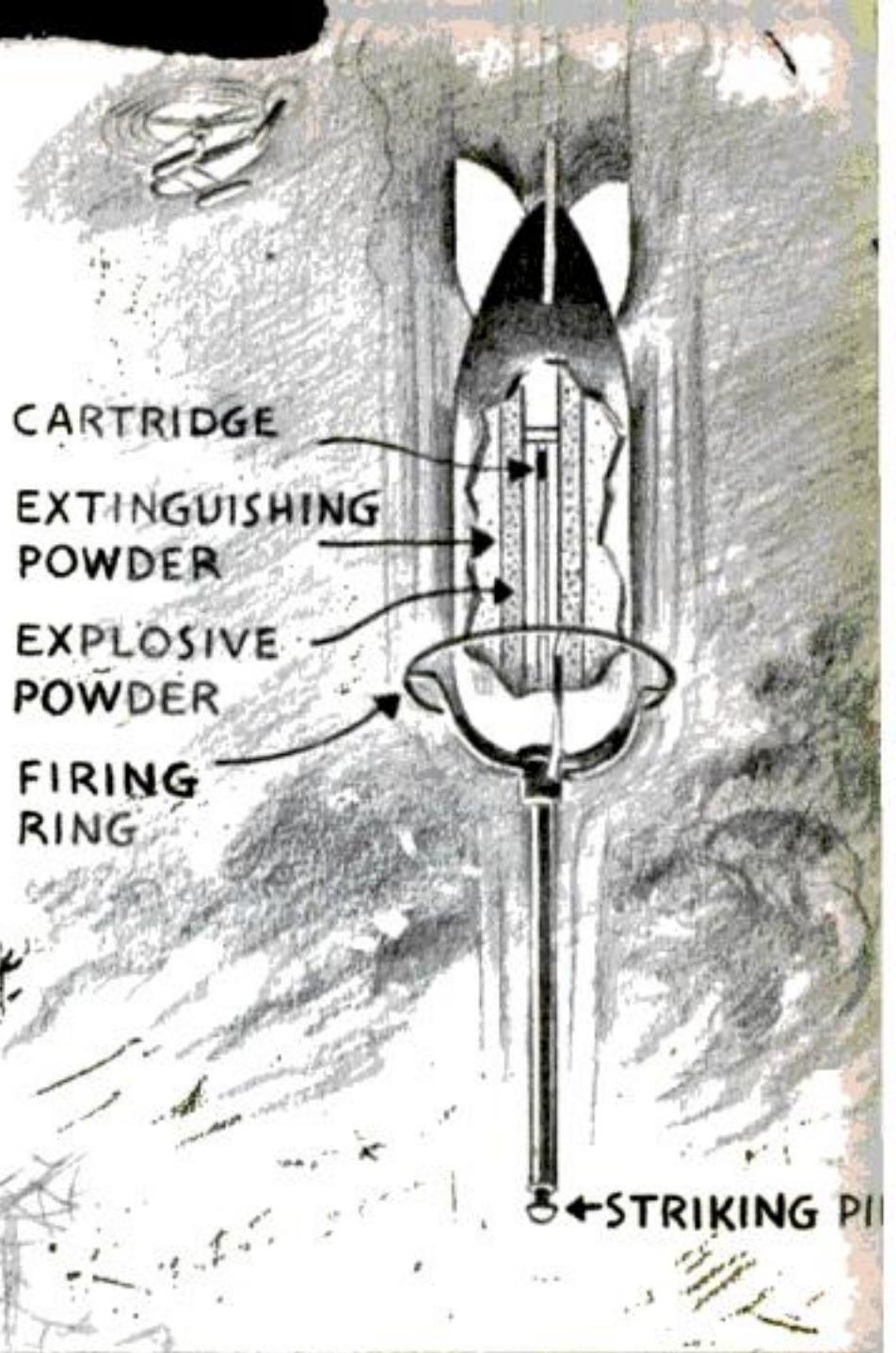
COMBINATION KIT BAG AND STOOL

at the left is spacious enough to hold much equipment and comfortable to use as a seat when the frame is spread apart. Inventor Edward S. Reid, of Charlotte, N. C., claims it is an exceptionally handy stool for hunters who wait for long periods of time in duck blinds or in fields. Gardeners, picnickers, and nurses will also find it useful. The kit portion contains sizable separate pockets that will accommodate shotgun shells, game, food, and other things. Strips of metal or wood form the frame, and fabric or leather, or a combination of both, is used to make the kit. Light in weight, the seat-bag is easily carried by the grips when the frame is collapsed.

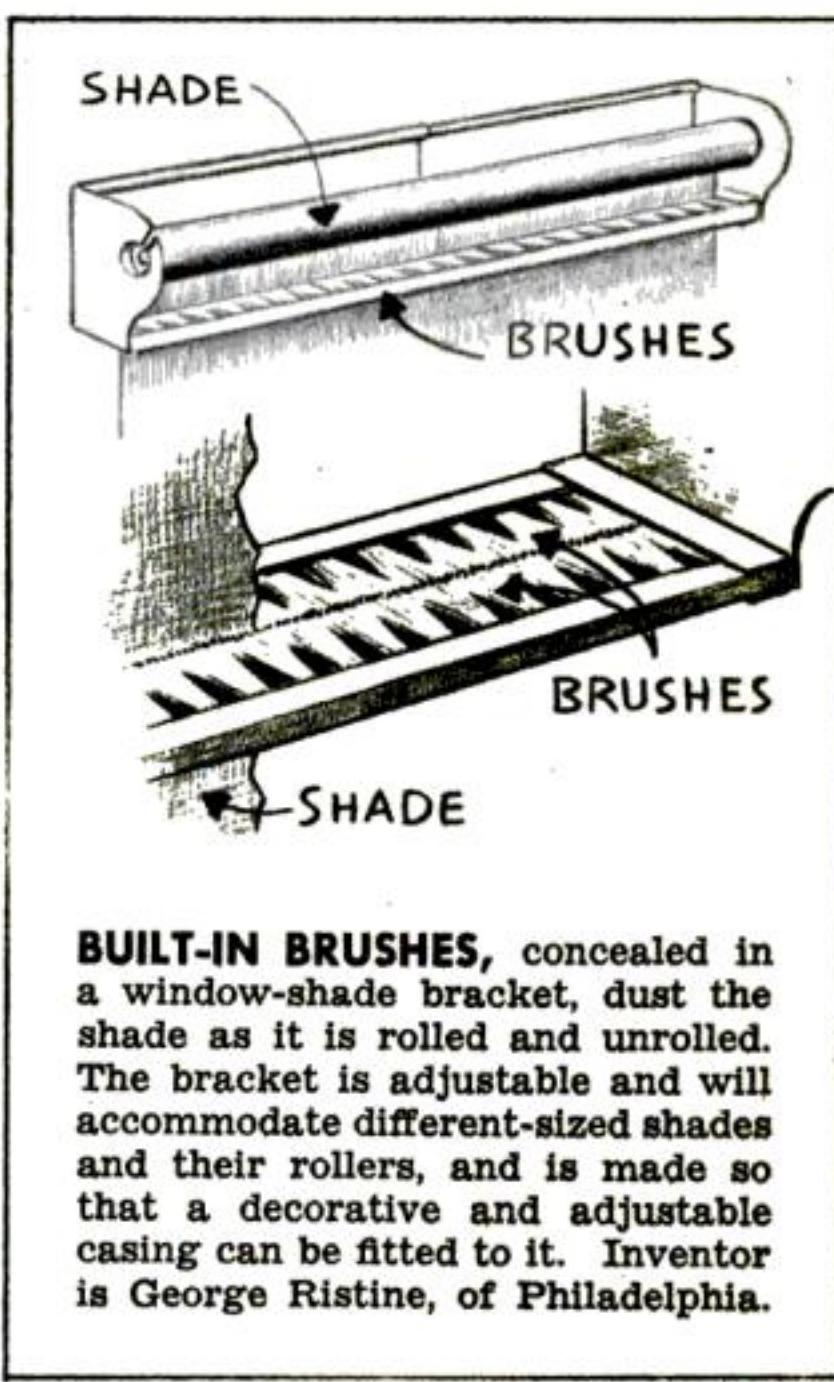
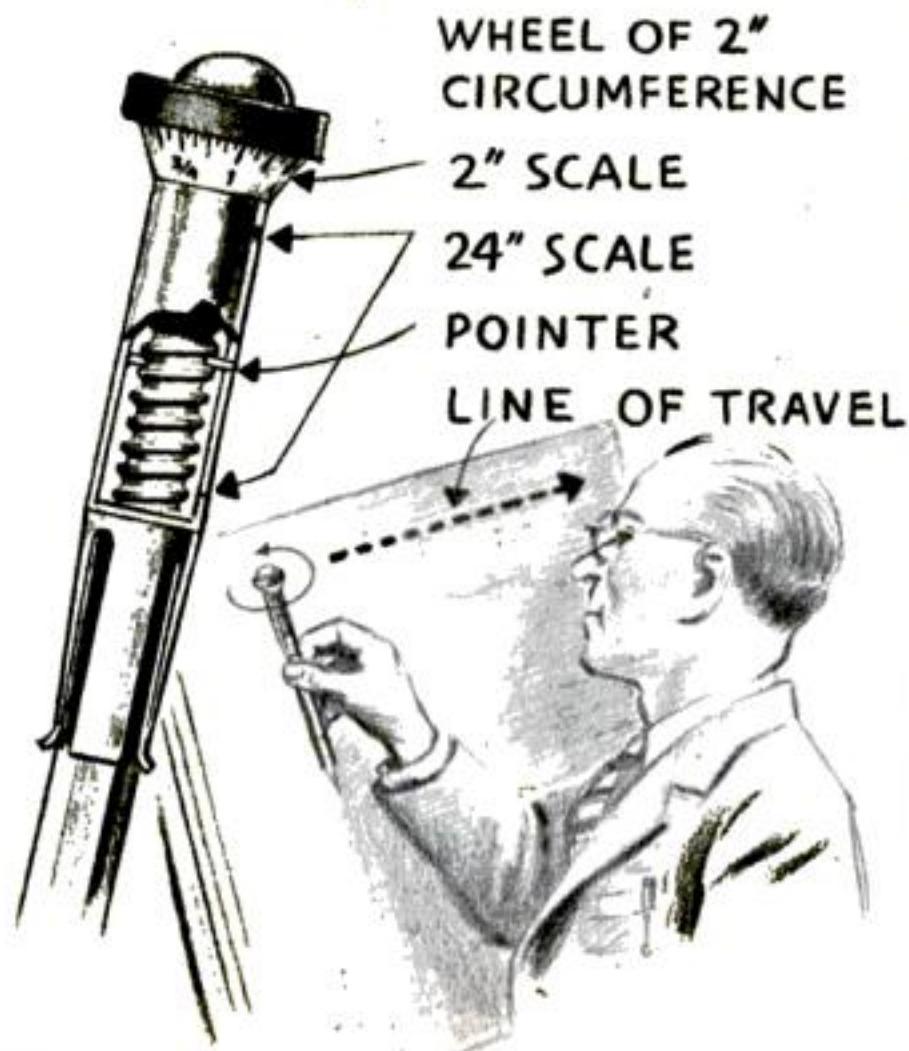


THE INVENTORS

FIRE-EXTINGUISHING BOMB, the opposite of the wartime incendiary bomb, enables fire fighters to attack forest fires and prairie fires from the air. Developed by L. W. Moore, of Baltimore, Md., the missile contains an explosive powder that is detonated when the striking pin hits the ground or when the firing ring comes in contact with any object in the burning area. The resulting explosion scatters a fire-extinguishing chemical on the fire and the surrounding area. The winged tail assembly causes the bomb to fall nose first and hit the ground on its detonating pin.

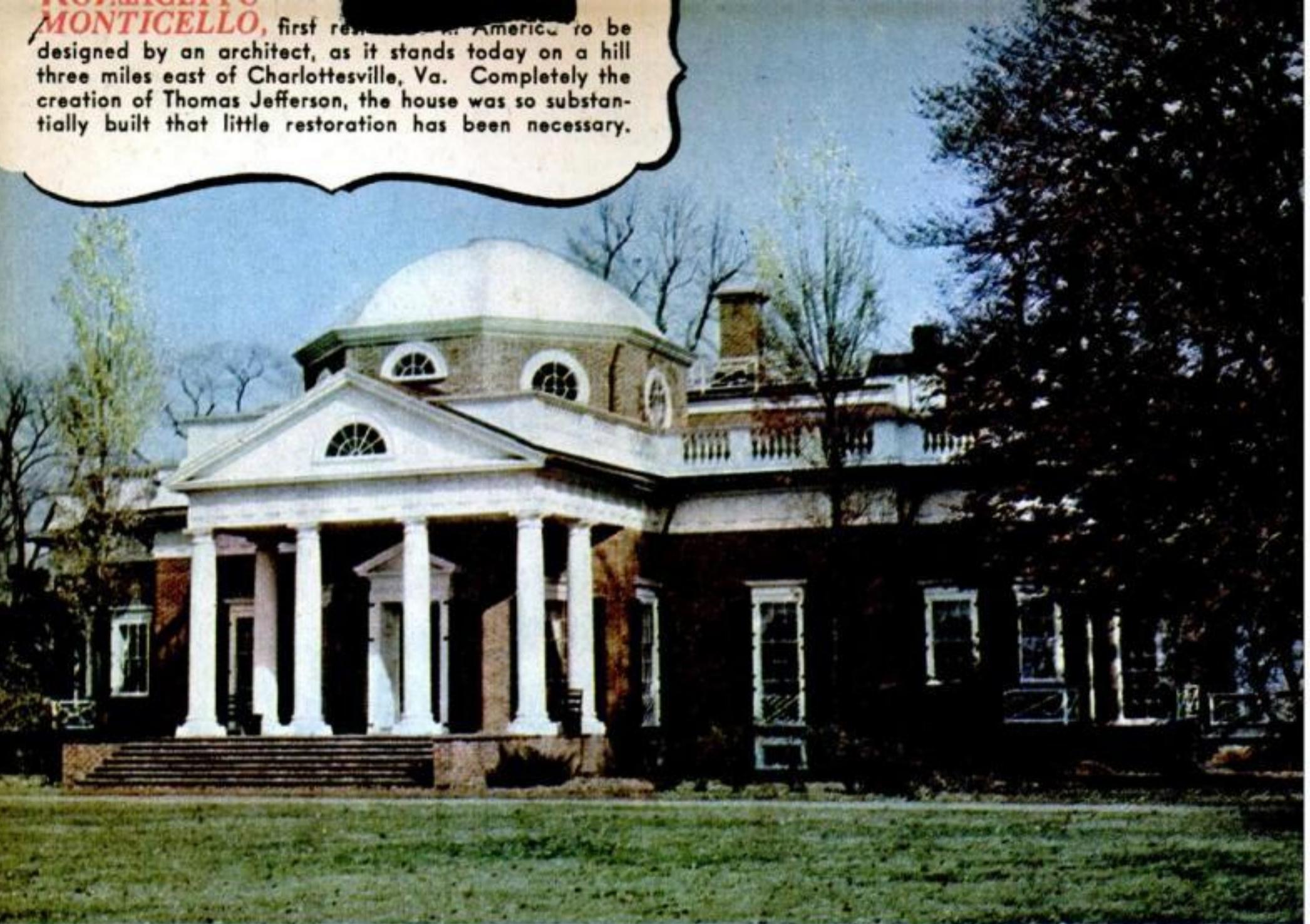


ROLLER RULE for quickly measuring distances and dimensions fits snugly over the end of a pencil, as shown below, or a fountain pen. Pressure on the rotating wheel as it moves across a surface turns a screw inside the barrel that moves an indicator along a 24-inch scale on the outside. One complete turn of the wheel measures two inches. J. H. Morehead, Long Beach, Calif., is the inventor.



BUILT-IN BRUSHES, concealed in a window-shade bracket, dust the shade as it is rolled and unrolled. The bracket is adjustable and will accommodate different-sized shades and their rollers, and is made so that a decorative and adjustable casing can be fitted to it. Inventor is George Ristine, of Philadelphia.

MONTICELLO, first residence in America to be designed by an architect, as it stands today on a hill three miles east of Charlottesville, Va. Completely the creation of Thomas Jefferson, the house was so substantially built that little restoration has been necessary.



POPULAR SCIENCE TRACKS DOWN THE TRUE STORY OF

Thomas Jefferson's Inventions



AUTHOR OF THE DECLARATION OF INDEPENDENCE
ALSO BELIEVED IN EMANCIPATING MEN FROM
ANY UNNECESSARY DISCOMFORT AND DRUDGERY

By
GOLD V. SANDERS
Photographs by
WILLIAM W. MORRIS

If HE did not have so many other claims to fame, Thomas Jefferson might today be celebrated as one of our greatest inventors. His mind fairly overflowed with mechanical ideas, and the fruit of his creativeness is everywhere in evidence. Had he not been so preoccupied with an even bigger job—creating a new government for a new nation—

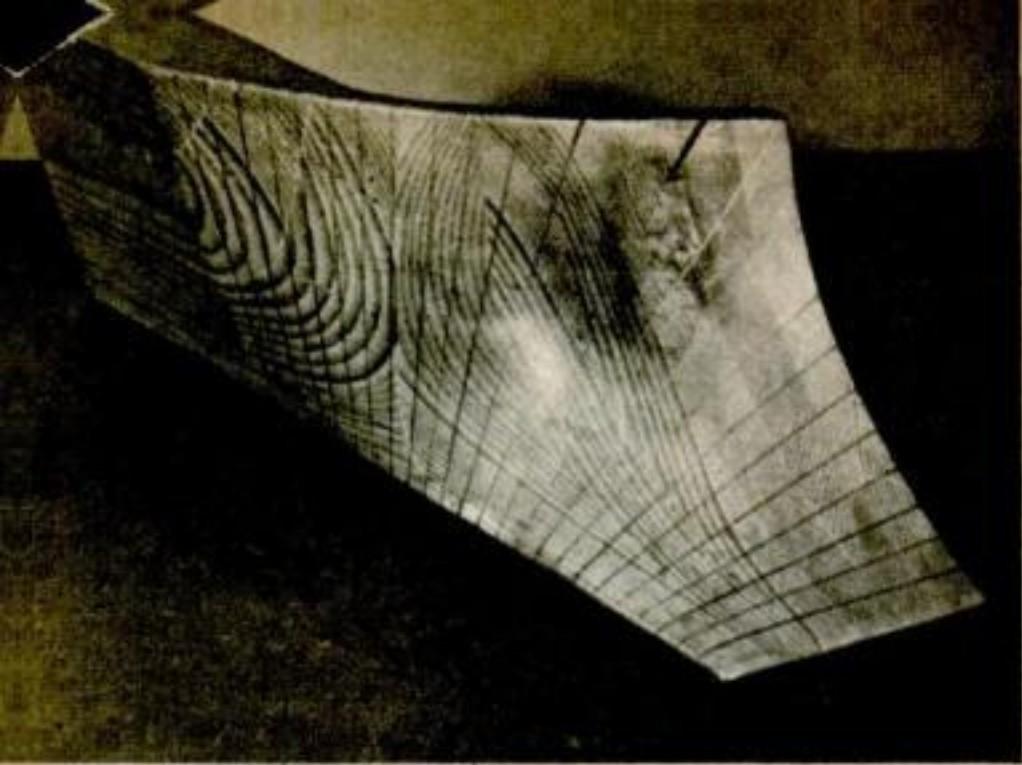
he might well have been the great scientist of his age.

Every plow that turns the soil is a better tool because of Jefferson. Never satisfied with time-honored methods in any field, he devised a moldboard based on the principle of least resistance, one that would turn the sod over instead of merely lifting and dropping it. That principle is embodied in all plows today.

A large-scale farmer all his life, Jefferson introduced the idea of contour plowing when he saw his hilly plantation being ruined by erosion. Sound as his idea was, it is only

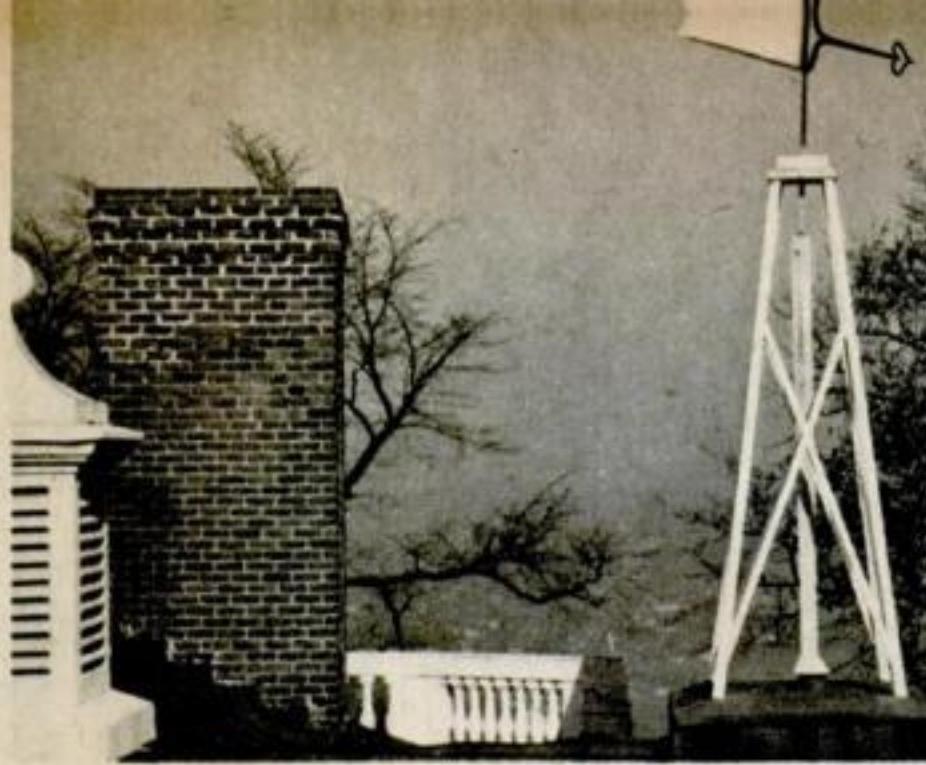
150 YEARS AGO, when a colonial miss opened one of the double doors on the first floor of Monticello, the other door swung open automatically with it, thanks to mechanism installed by Jefferson and still concealed in the paneling. This miss of today finds the doors still working perfectly, except for a play in the action due to decades of use.



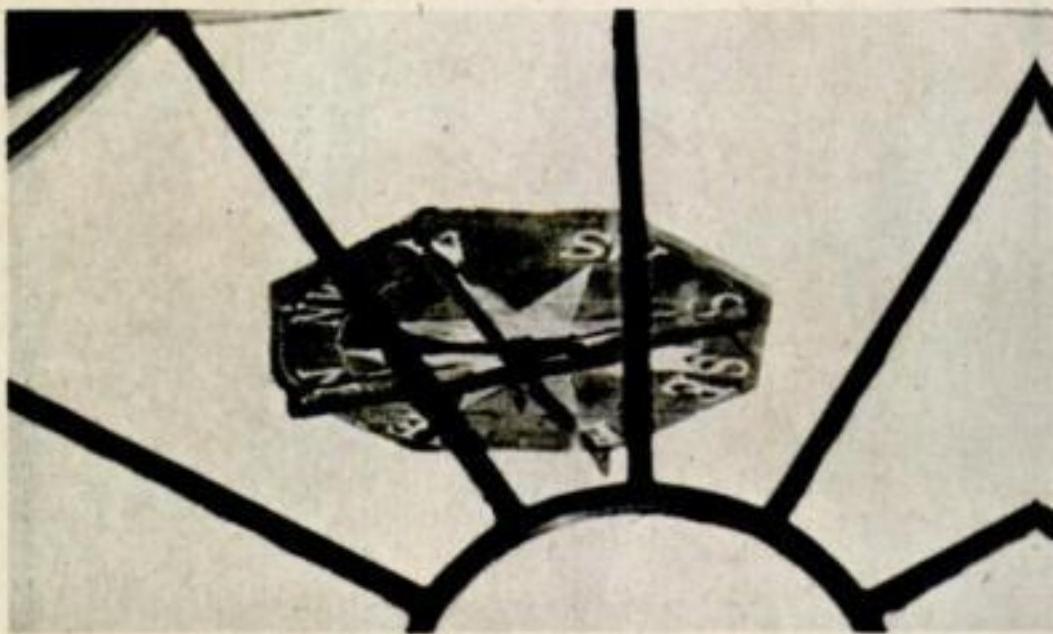


STREAMLINED IN CONTOUR, Jefferson's "improved moldboard for a plow" was designed to follow the lines of the least resistance in turning the sod. Its principle is used in plows today.

ONE OF FIRST in existence, if not the first, the dumb-waiter installed in Monticello by Jefferson was designed to deliver wine to the dining room from the cellar. It is concealed by a panel door in the side of the mantel when not in use.



THE WEATHER VANE on the east portico is like others of its time—with a difference. Jefferson brought the shaft down through the roof to the ceiling of the porch, where he placed a dial, shown in photo below. Thus it was possible for him to learn the wind's direction without leaving the house.

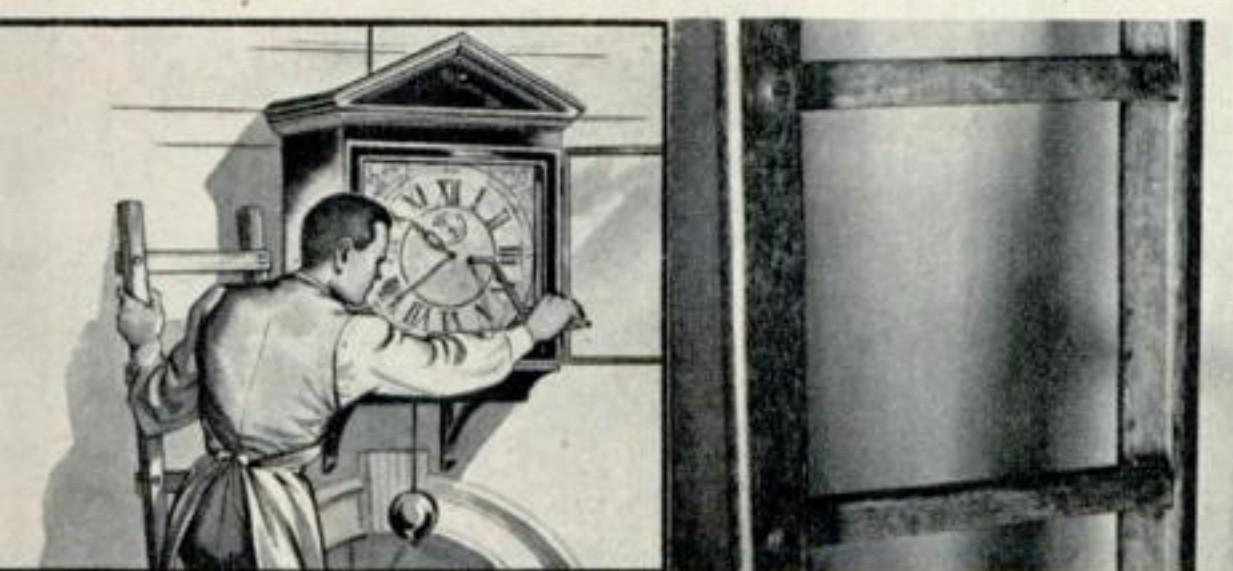
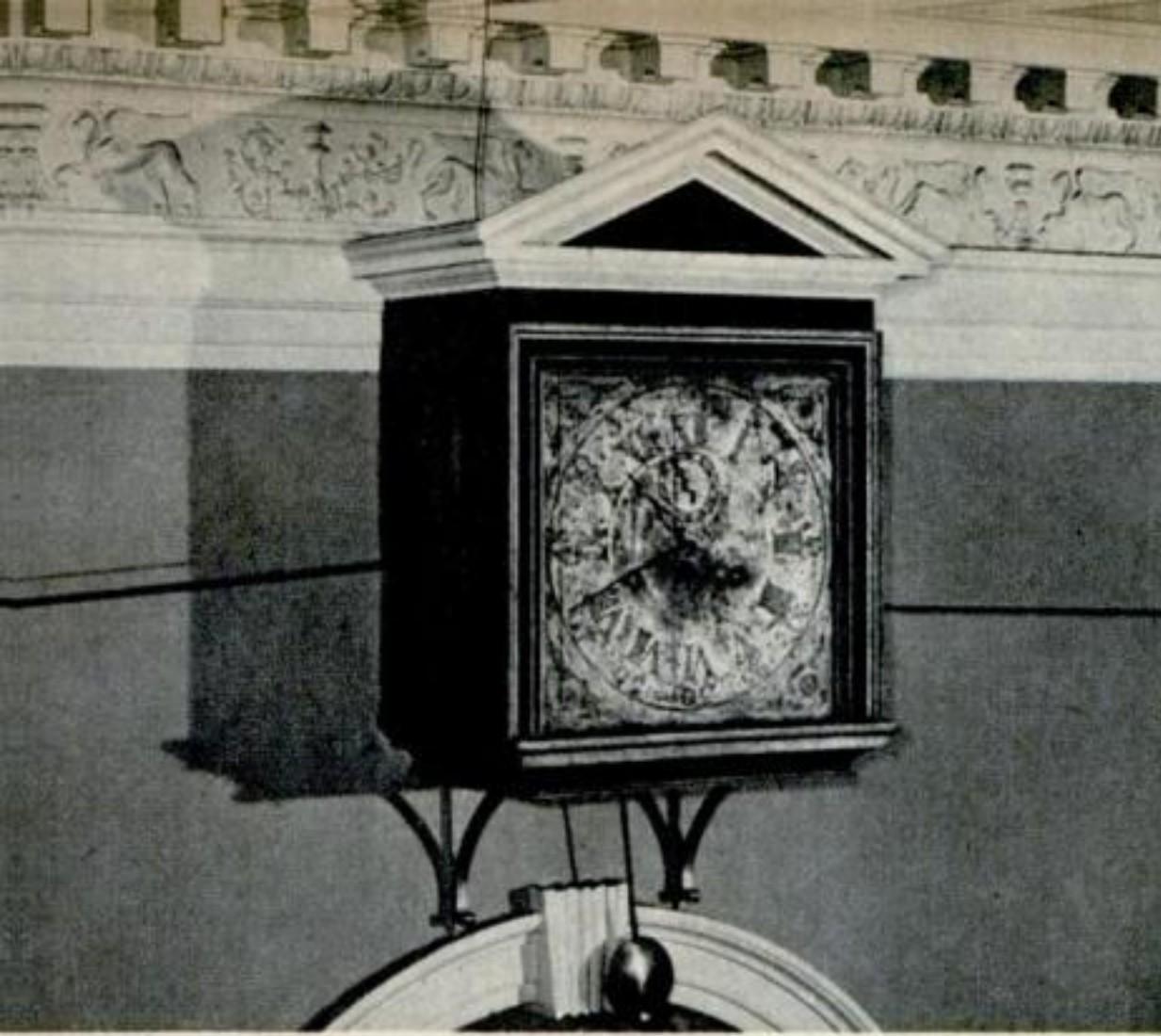


in comparatively recent years that it has really taken hold throughout this country.

Jefferson believed the everyday chores of life consumed too much time, and he created numerous devices to simplify these tasks. Many of his inventions are preserved in his famous home, Monticello, in Virginia. Others are known only from notes, drawings, or reports. When he built his home, he installed a dumb-waiter, possibly the first, to send up wine from cellar to dining room.

Atop the east portico is a weather vane, much like others of the time, but Jefferson brought the shaft all the way through to the porch ceiling and placed a dial there so that one could see which way the wind was blowing without going outside.

There is an immense clock in the drawing room, built by a Swiss to Jefferson's design, which tells the day of the week as well as the hour. Cannon balls on ropes provide the motive power for the hands and gong. It is wound once weekly by a long crank. The days are inscribed on the wall where the balls pass them in slow, gradual descent. Since a servant had to climb a



JEFFERSON'S INGENUITY is nowhere better exemplified than by this clock, built to his plans by a Swiss clockmaker. It was operated by two sets of cannon balls, whose slow descent also marked the passage of the days. Jefferson also designed a folding ladder for the man who wound the clock.

ladder to wind this clock, Jefferson devised a folding ladder of unique design for that purpose. It is still at Monticello.

Between the two great rooms on the first floor are double doors provided with an ingenious apparatus hidden behind the paneling which causes both to open or close in unison. No one seems to know how it works, as the paneling has never been removed.

Monticello, incidentally, was the first residence in America built by an architect. Jefferson was that architect and today is recognized as a very great one.

It is believed Jefferson had ideas on air conditioning. Only this can account for the elaborate air shaft built of stone which runs from below the hill at Monticello into the basement of the house. How well it worked is not recorded; the inside end was sealed some years ago.

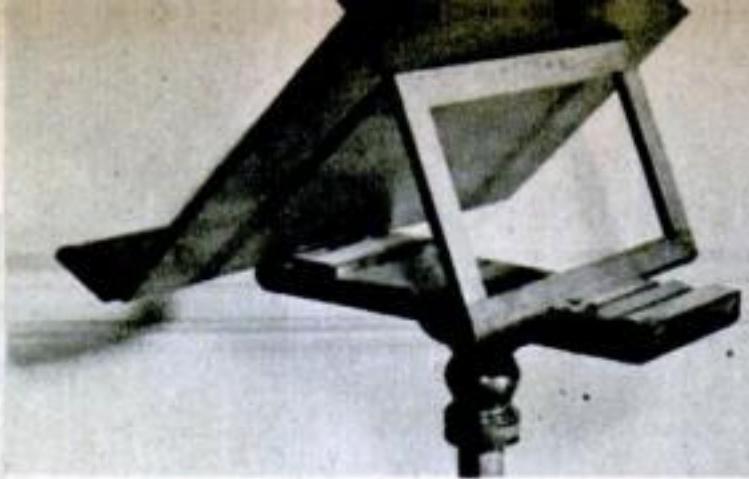
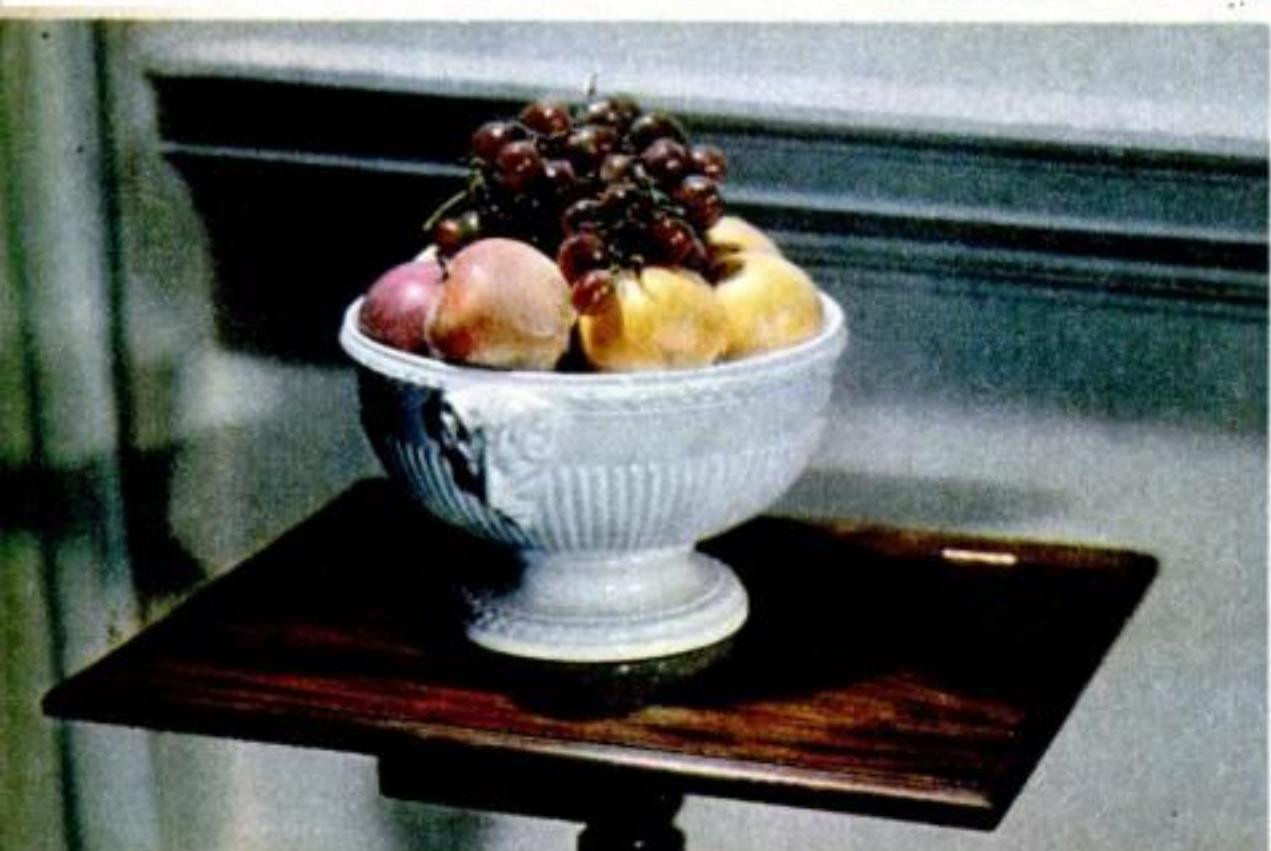
Not only did Jefferson improvise, but he was quick to adopt new ideas wherever he

found them. To this trait we owe the swivel chair, which he discovered in France. He had at least two revolving chairs made by his skilled slaves. (Although he owned slaves, Jefferson was opposed to the idea of slavery.) One chair is still there and another is preserved by the American Philosophical Society in Philadelphia. The second has an added Jeffersonian touch, a writing arm.

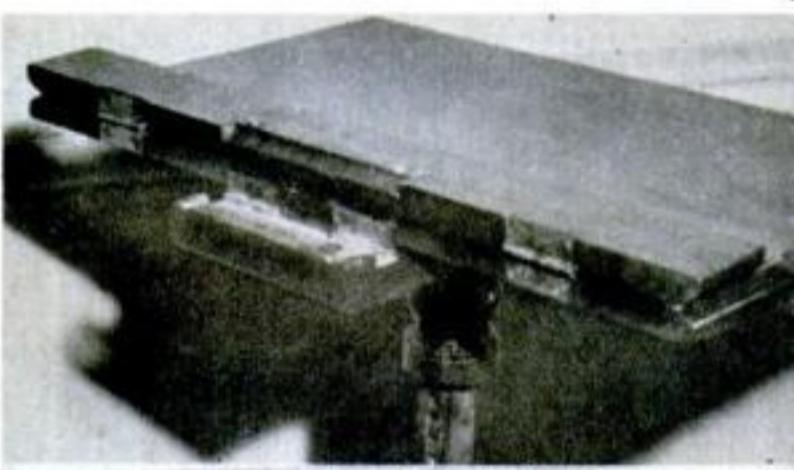
One of the statesman's own inventions, important in its time, was the portable copying press, a simplification of the customary screw press. His drawing for this, with its meticulous lettering and description, is preserved by the Massachusetts Historical Society.

Jefferson never applied for a patent. He made sketches of an invention primarily for the use of the workman who was to produce it. There is no record of his having ever made anything with his own hands. When he found an invention useful, he often





MUSIC STAND. Jefferson, an accomplished violinist, stood many hours before this stand, practicing on his favorite instrument. The slope of the music rack is adjustable, as the photo above shows. In addition, the rack could be lowered and thus converted into a table (see photo below). This stand is believed to have been made by a skilled artisan among Jefferson's slaves at Monticello.



made careful specifications which he sent to friends. He apparently never thought of inventing for profit.

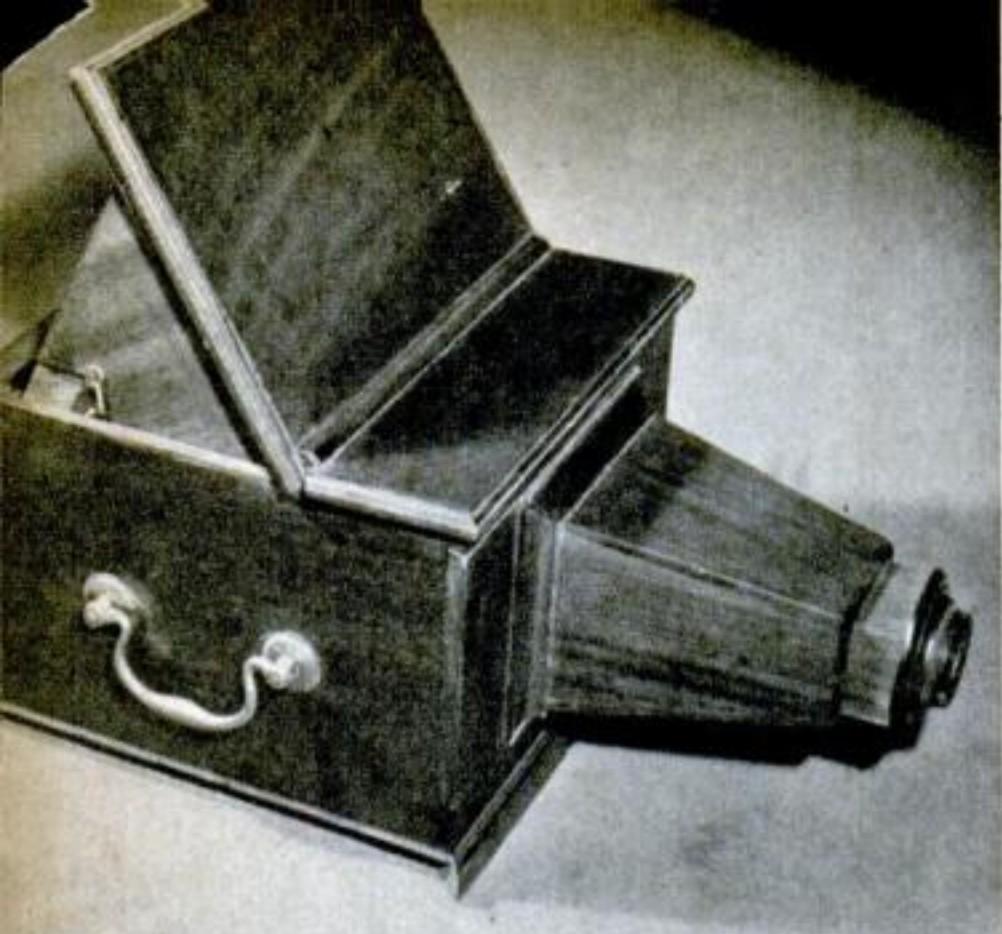
Jefferson abandoned the copying press when he discovered the polygraph, invented by another. Of this instrument he wrote a friend in France, Count C. F. C. de Volney, as follows:

"Our countrymen are so much occupied in the busy scenes of life, that they have little time to write or invent. A good invention here, therefore, is such a rarity as it is lawful to offer the acceptance of a friend. A Mr. Hawkins, of Frankford, near Philadelphia, has invented a machine which he calls a polygraph, and which carries two, three, or four pens. That of two pens, with which I am now writing, is best; and is so per-

THE MUSIC hour ended, the rack becomes a low decorative table.



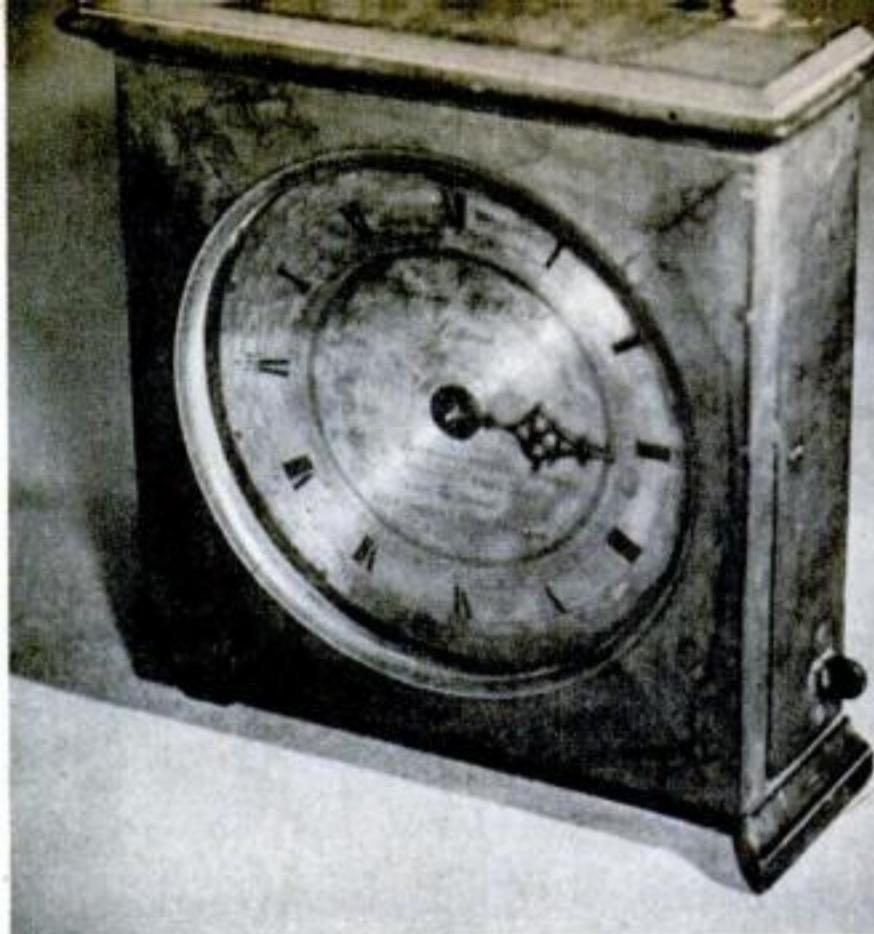
ONE STAND—FOUR PLAYERS. Another of Jefferson's ingenious devices was this music stand, with adjustable racks for four players. The stand itself revolved atop the cabinet where it was placed. The cabinet was used to store music and still contains some of Jefferson's own. It is now at Monticello. 109



PHOTOGRAPHIC PRINCIPLES intrigued Jefferson. His camera obscura could not, of course, take pictures. It reflected an image on ground glass at the back and this could be traced on tissue paper.

fect that I have laid aside the copying press, for a twelvemonth past, and write always with the polygraph. I have directed one to be made, of which I ask your acceptance . . ."

The portable writing desk on which he penned the Declaration of Independence was a neat contrivance which Jefferson designed himself, but which was made for him by a Philadelphia cabinetmaker. Its tilting, adjustable writing top must have served him well, for he later had two larger desks made, with similar features, at Monticello. One is an architect's desk at which he stood, pre-



THIS ODOMETER was attached to the hub of the wheel of Jefferson's carriage. The hand moved a notch with each revolution, tallying distance traveled. Jefferson's notes say he bought it for \$10.

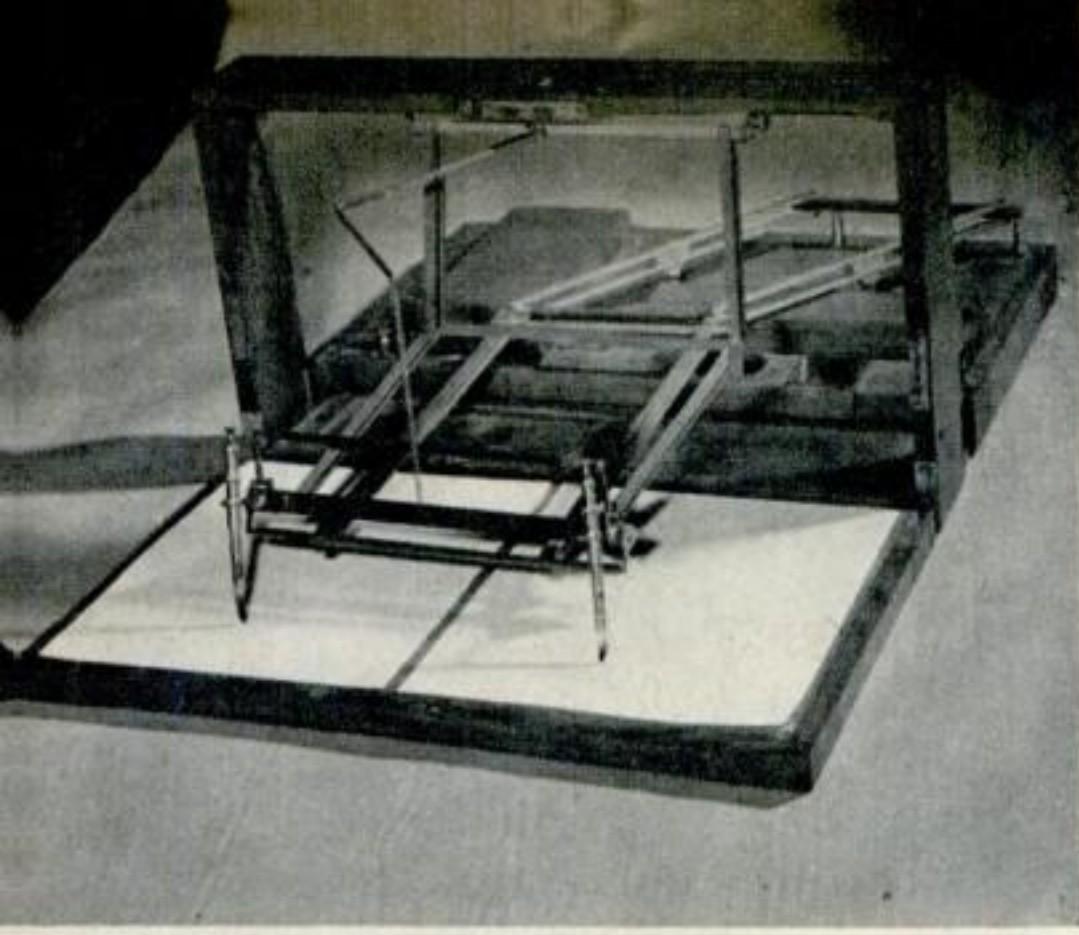
sumably, while designing such notable buildings as the University of Virginia, the state capitol of Virginia, the home of James Monroe, near Monticello, and mansions for other friends.

For the home of one friend, Jefferson provided a sort of "lazy Susan," installed in the wall between dining room and pantry and revolving so that food could be sent in by turning it about.

Jefferson was the first, after Benjamin Franklin, to make use of bifocal spectacles. Seeing the ingenious doctor making good use of them, Jefferson sent his optician in Phila-



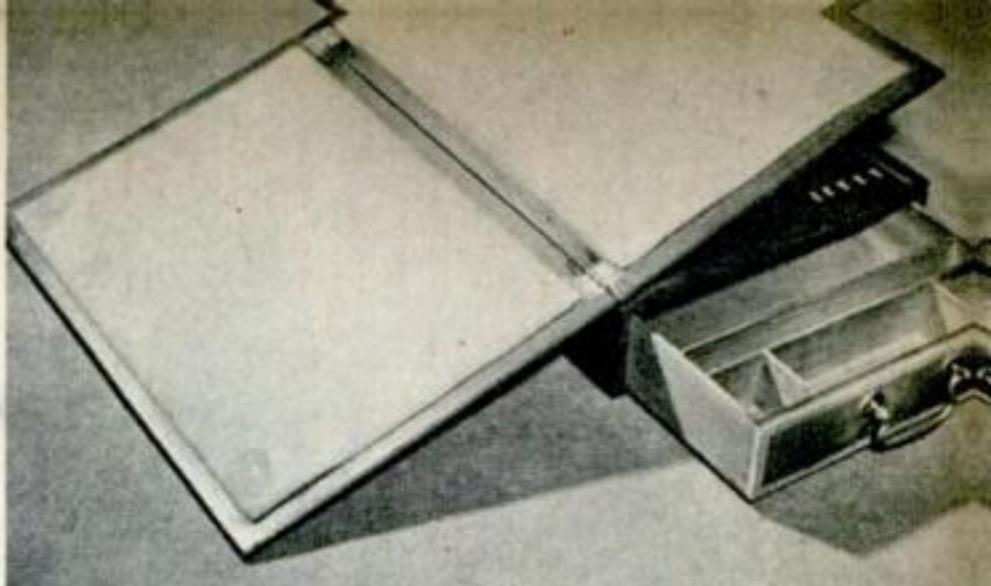
THIS HE BORROWED FROM THE FRENCH. Thomas Jefferson has often been credited with the invention of the revolving chair; actually he was the first to introduce it into this country after bringing one from France. Chair in photo, although of the revolving type, does not swing freely. Jefferson used it in conjunction with a padded bench, on which he stretched his legs while writing, and a table with a revolving top, believed to have been made to his design at Monticello. It was here, undoubtedly, that Jefferson conducted much of the voluminous correspondence of later years.



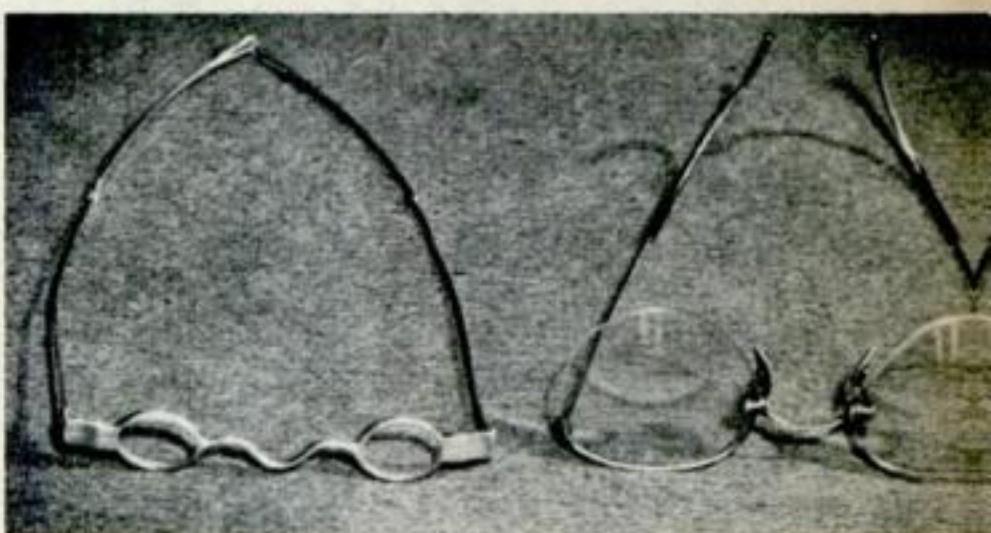
THE POLYGRAPH so impressed Jefferson that he used it in preference to a copying press of his own invention. As Jefferson made copies of all his letters, the dual-pen device proved invaluable.

delphia a drawing of Franklin's and ordered a similar pair, with a set of semicircular lenses of different strength.

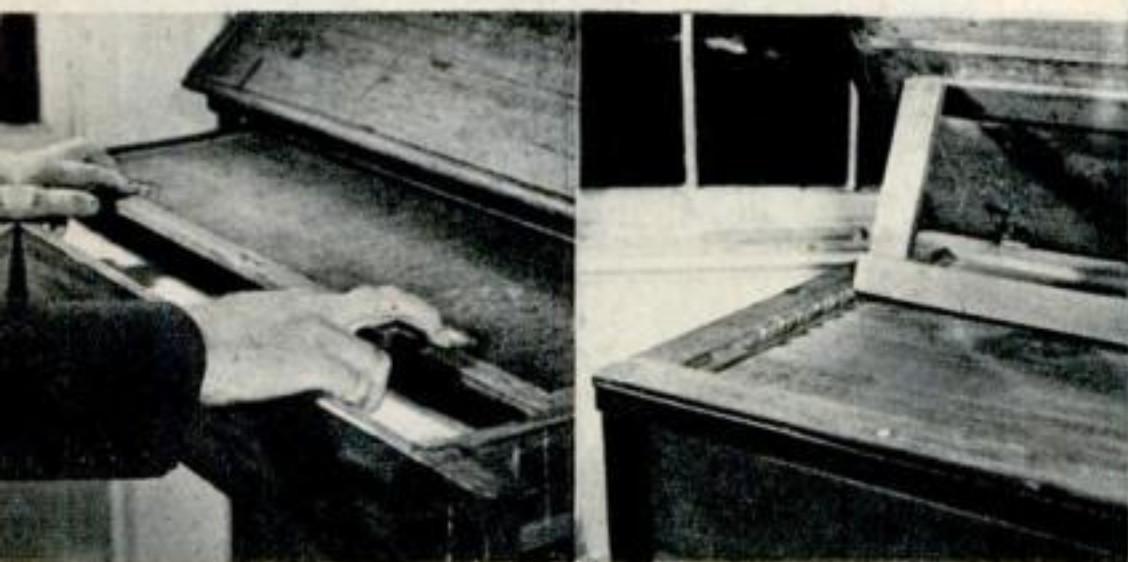
There is no way of knowing how many gadgets Jefferson invented. In bits of correspondence it is revealed that he devised a new kind of flax beater. He had a convenient contrivance near his bed for hanging up clothes and a machine for measuring strength. Edmund Bacon, his overseer for 20 years at Monticello, said Jefferson was forever busy with some design or model. Bacon declared Jefferson was the first to introduce full-blooded Merino sheep and Cal-



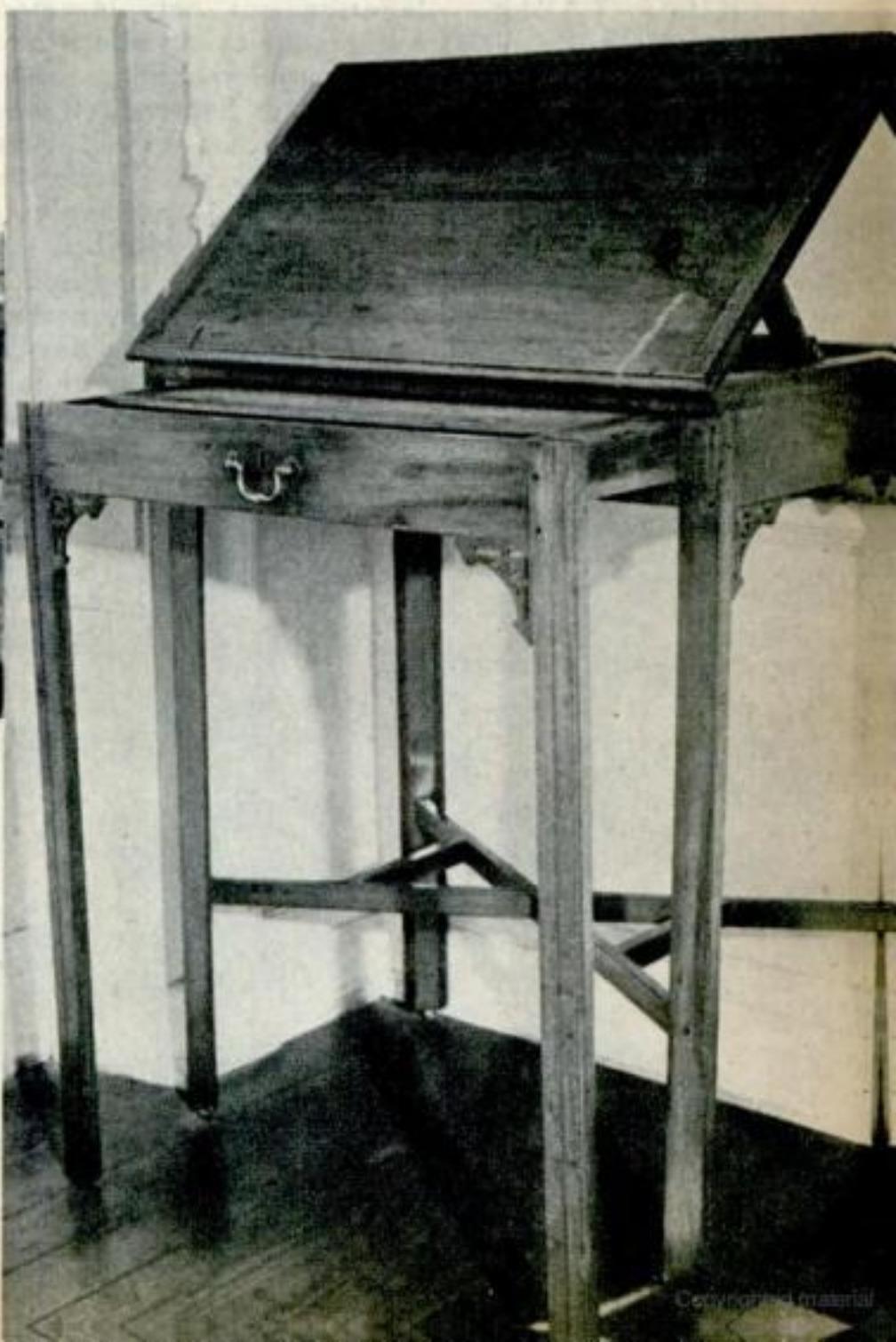
DECLARATION OF INDEPENDENCE was written by Jefferson on this portable writing desk of his own design. The desk has a folding and tilting top and a small drawer for writing material.



SPECTACLES worn by Jefferson are shown next to a modern pair. Small lenses were for reading and he looked over them for far vision. Jefferson sent minute instructions and drawings to his optician.

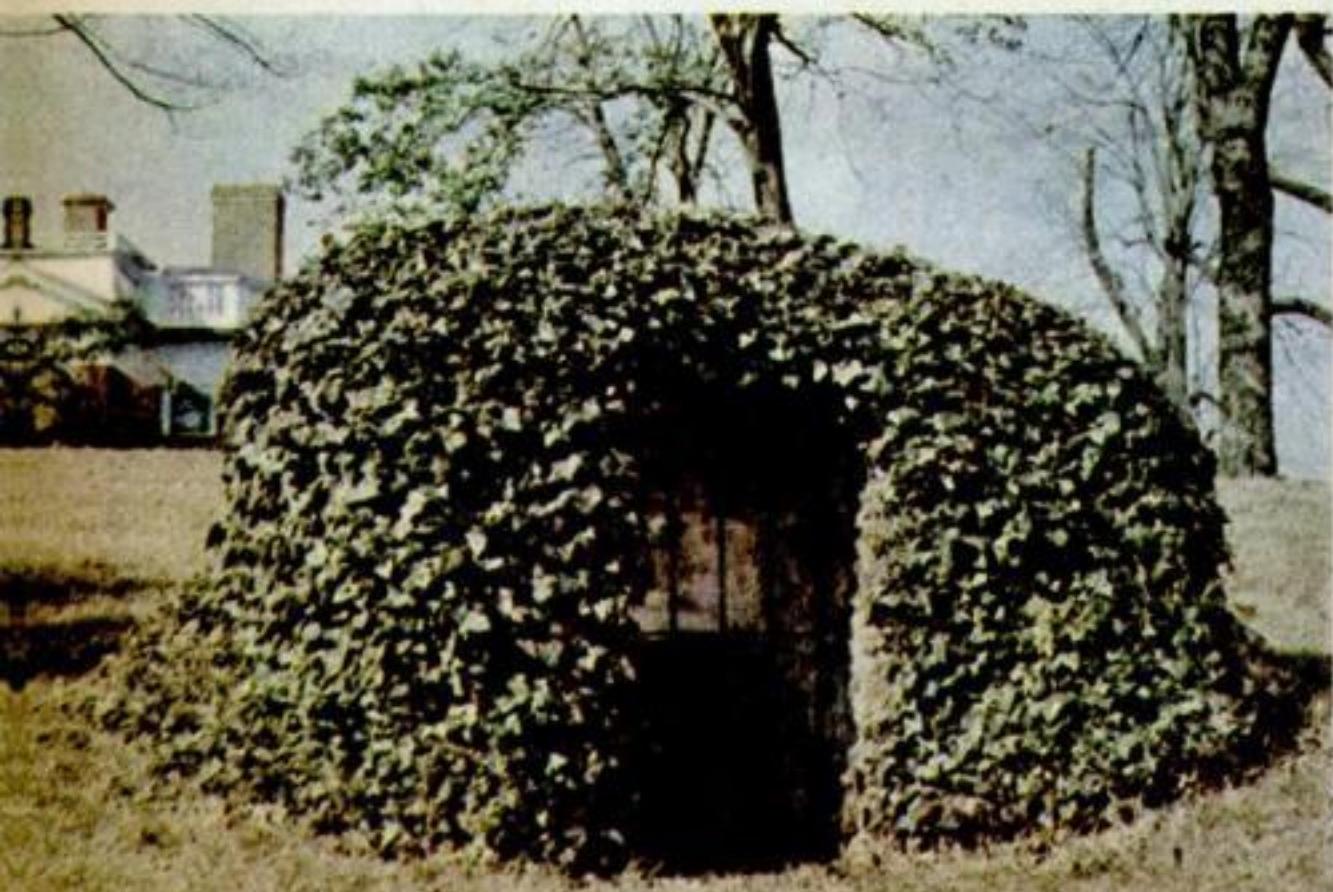
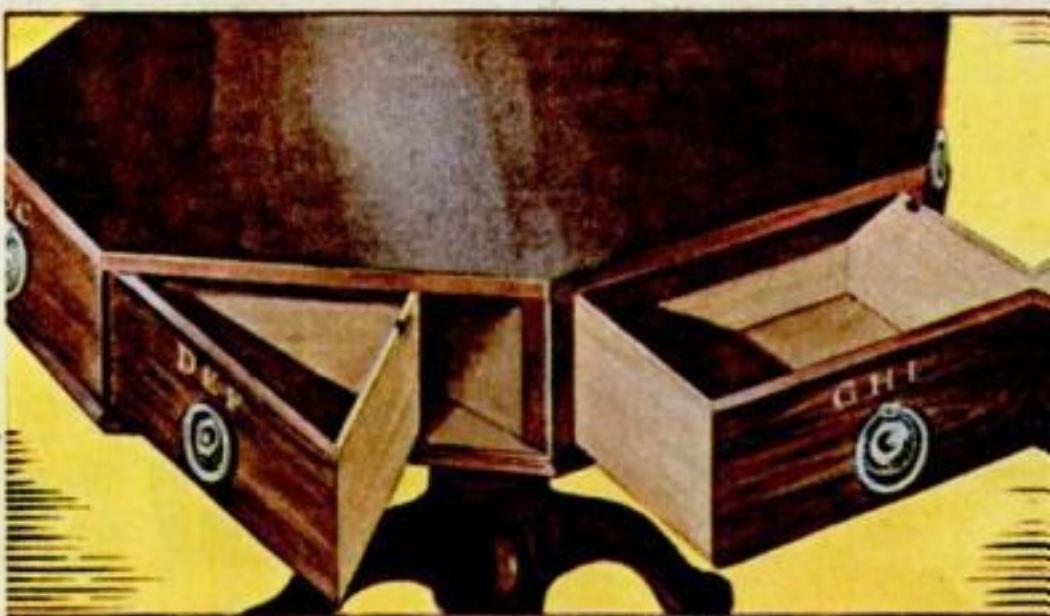


ARCHITECT'S TABLE. At this desk were conceived some of the most beautiful buildings in America. Here again Jefferson laid heavy stress on convenience. The drawer has a special pair of legs to support it when it is drawn out, as shown in the photo at the right. The top of the drawer can be made to slide back and forth (photo at the left), thus serving as an auxiliary table. Photo in the center shows the back of the tilting top, and the notches permitting it to be set at various angles.

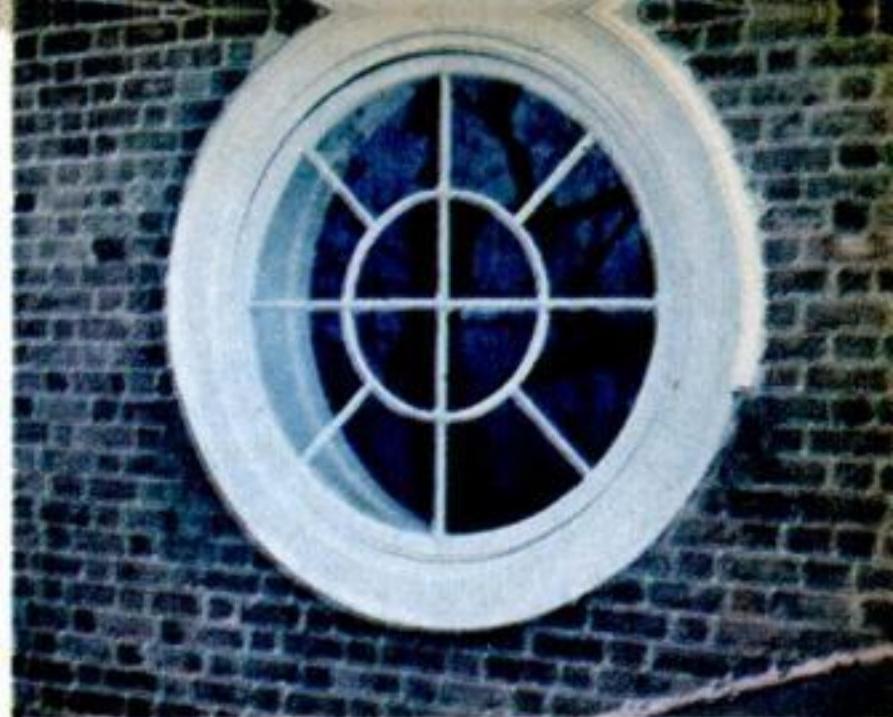




FILING TABLE. Jefferson not only invented many useful objects; he was quick to adopt the innovations of others. He bought this filing table, now on display at Monticello, in England. It has eight compartments for filing papers, three letters for each drawer. For unknown reasons, Jefferson eliminated the letters J and V from his filing system. In order to fit under the eight-sided table, the drawers had to be alternately triangular and quadrangular. Drawing at right shows how they nested under the top. There is an ingenious locking device on the table that may or may not have been of Jefferson's design. The entire table top can revolve.



HIS COOLING SYSTEM?
Air conditioning à la Jefferson. This is the vine-covered entrance to a stone shaft, some 300 feet in length, that leads from a point below the hill at Monticello into the cellar of the old mansion. The belief is that Jefferson intended it for air-circulation purposes, to cool the house in summer, but no mention of it has been found in the statesman's records. The basement terminus of the tunnel was sealed off many years ago.



SOLID STUFF. The bricks, made of native red clay, and the mortar, prepared under Jefferson's supervision, were of amazing durability. Today, despite 175 years of exposure, they look almost new.

DINING-ROOM MANTEL at Monticello is admired by a modern miss in an early nineteenth-century costume. The mantel insert, made by Josiah Wedgwood, well-known English potter, was picked up in London by Jefferson. The clock was purchased in Paris. Both are characteristic possessions of Jefferson, who was constantly in search of the beautiful as well as the useful in all things.

cutta hogs to Virginia. Both were improvements over existing breeds, and Jefferson provided blooded sires for the whole countryside.

Jefferson also introduced countless crops, fruits, trees, and decorative plants from Europe and from other sections of America. When these flourished in Virginia, he furnished seeds, cuttings, and seedlings generously to friends. His experiments with imported olive trees were without success, however.

Jefferson was virtually the father of the

U. S. Bureau of Standards, but tried in vain to gain the adoption of a decimal system of weights and measures by the Government. If his will had prevailed, we would not be plagued today with the intricate, unsystematic hodgepodge still in use.

In every field Jefferson was the innovator, the experimenter, the inventor. The same zeal with which he pursued the struggle for liberty of men's souls actuated him in a constant search for means of improving the physical well-being and comfort of his fellow man in everyday life.

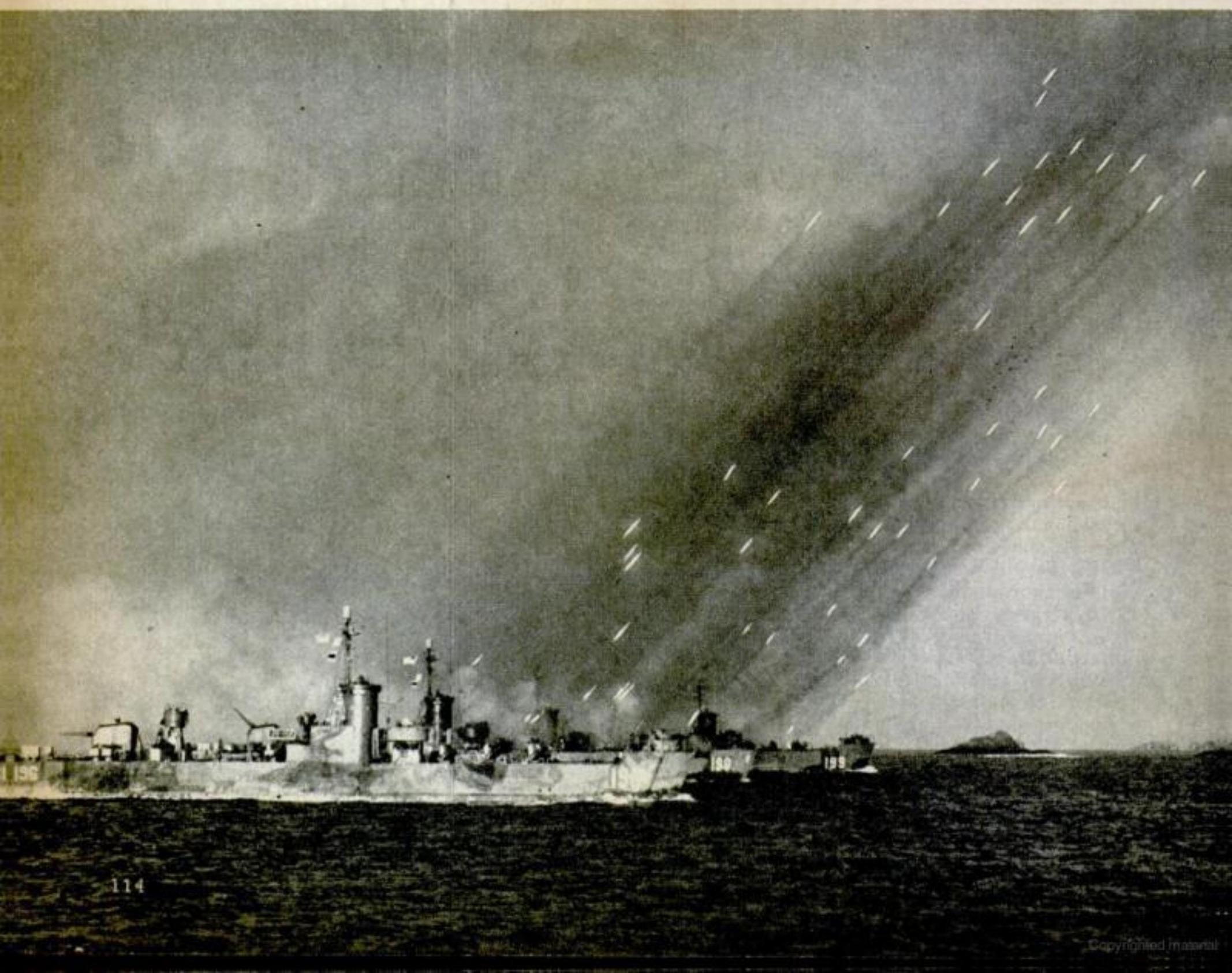
JEFFERSON'S TOOLS. The paint box and drafting instruments with which the Sage of Monticello drew designs for his numberless gadgets, magnificent buildings, gardens, roads, fences, mills, and machines. As Jefferson was not himself adept at handwork, he drew up meticulous plans for others to follow. He designed the buildings for the University of Virginia, which he helped found in 1817. Jefferson also directed the academic development of the school.



BEST NAVY PHOTOS OF THE WAR

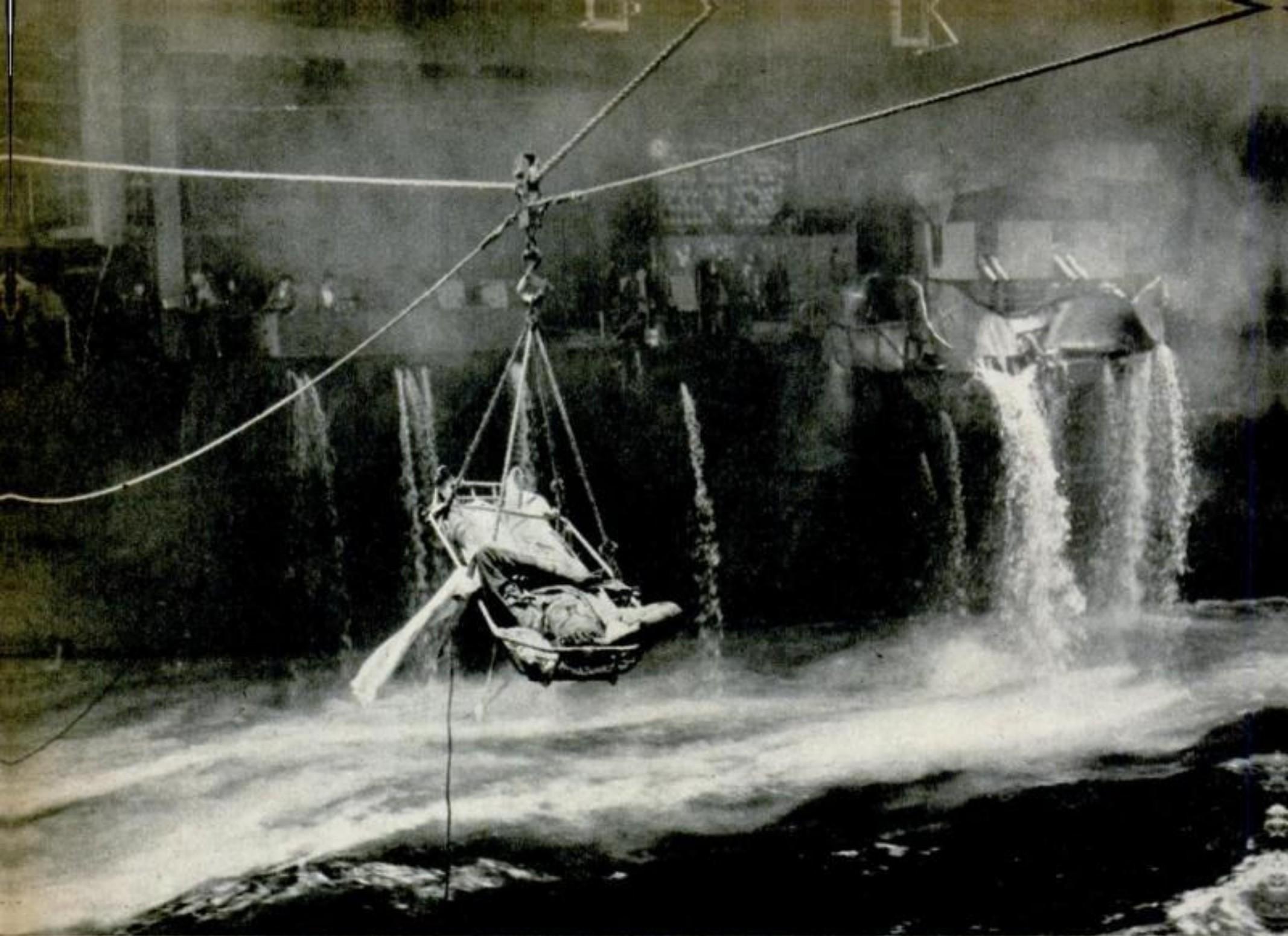
WHILE the U. S. Navy, Marine Corps, and Coast Guard were helping to hammer the Germans and Japs into submission, their photographers in uniform were busy preserving on film the dramatic story of the greatest war in history. The result is a pictorial record of inestimable value to both naval experts and civilians. From this album of battle Capt. Edward Steichen, director of the U. S. Navy Photographic Institute, selected the hundred best pictures for exhibition to the public. On this and the five following pages Popular Science Monthly presents nine outstanding prints that combine high photographic quality with the vivid reporting of history in the making.

ROCKETS AT OKINAWA. LSM(R)'s send up volleys of projectiles to clear the way for landings.





END OF A JAP. An enemy torpedo plane goes down in flames after receiving a direct hit from carrier anti-aircraft guns in operations near Saipan.



TRANSFER AT SEA. A wounded man goes over the side of the Bunker Hill to a waiting cruiser.

PACIFIC BATTLE. The Enterprise, a destroyer, and the South Dakota fight Japs at Santa Cruz.





END OF A U-BOAT. Nazi sailors hug the conning tower of a submarine under attack by planes.

THE KILL. A U.S. plane circles above the oil slick that marks the grave of another "scratched" sub.





WADING IN. Carrying their rifles high, U.S. Marines plow through the surf for the landing at Cape Gloucester on New Britain. This remarkable shot captures all the drama and suspense of hitting the beach.



ASSISTED TAKE-OFF. Rockets attached to the fuselage kick a heavy Martin Mariner into the air.

A LETTER HOME. Enlisted men relax in the crew's quarters of the famous carrier U.S.S. Yorktown.





Personal Ornaments Fashioned from Colorful Sea Shells

FOR centuries man made his knives out of sharpened shells. His first coins were shells. The first jewelry was also shells—shell necklaces and shell earrings. And now this ancient industry is staging a revival as a colorful hobby.

The cost of materials is negligible. A trip to the seashore, or a look through the children's box of mementos from that trip

last summer, will supply you with enough shells for fashioning many small ornamental objects. From shells you can make earrings, pins, ash trays, miniature flowerpots, and even dainty tea sets.

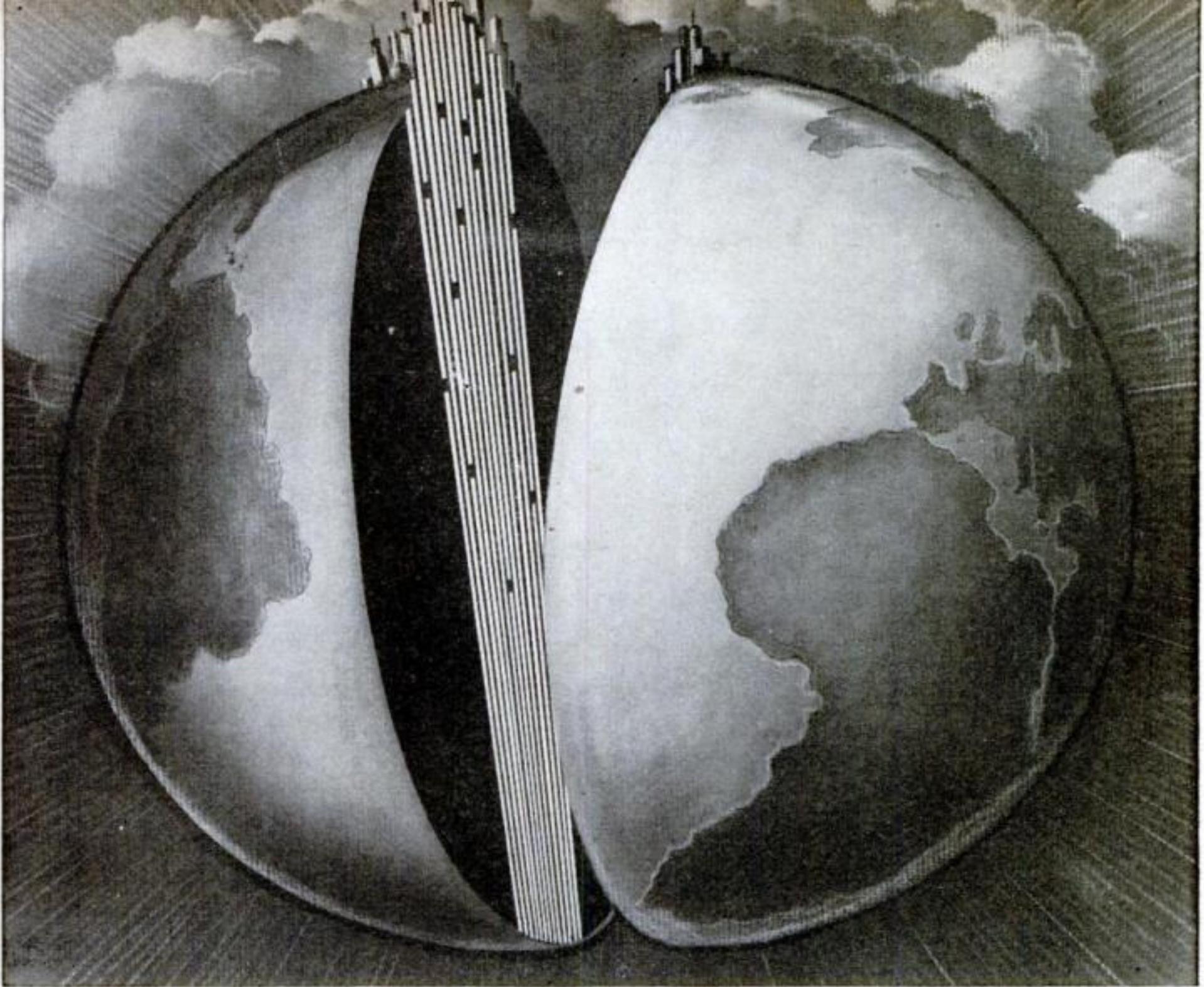
All you will need besides the shells are a few plastic findings and a tube of liquid cement. For detailed methods of construction, turn to page 156.

Puffing Iron Horse Decorates Wooden Fireplace Bucket

DRAB though the life of our ancestors may have been in many respects, they used color whenever possible in their homes. Tole ware, painted trays, hooked rugs, and other housewares showed abundant use of color, as did the embellished carriages of the rich. Much of the ornamentation that has come down to us is of a simple, almost childlike sort, yet pleasing and refreshing. It is an art of the people, naive yet genuine in its own right.

Such a decoration, original but in the spirit of that earlier day, is shown on the fireplace bucket at left. It is done by a simple means of transferring a design on ruled squares and is finished in color enamels, as described on page 161. The design is appropriate also on a fireplace screen or tray, or it can be woven into a rug.





Hard-working passenger elevators pile up enormous mileages. In New York City alone, they travel daily a distance equivalent to 13 trips through the earth, lifting and lowering more than 10,000,000 people.

VERTICAL RAILROADS

Their Traffic System Protects Millions of Passengers Going Millions of Miles a Day.

By FRANK ROWSOME, JR.

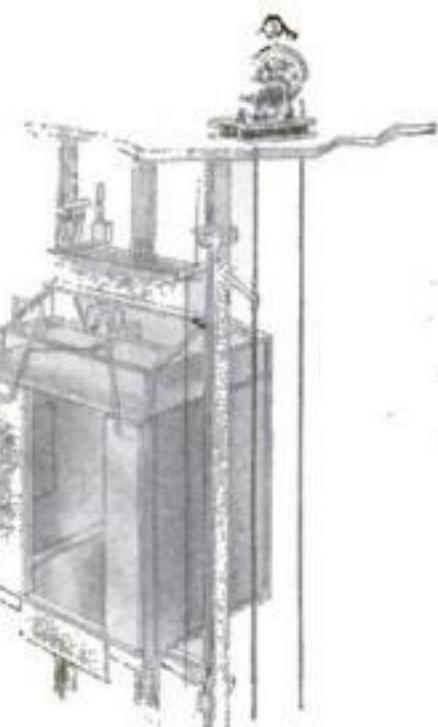
AMERICA has a transportation system which, in New York City alone, carries four times as many passengers every day as all Class I railroads. Ten million people a day are lifted or lowered 95,000 miles by New York's elevators. These short-haul, indoor, vertical railroads—most appreciated when stopped by a strike—have added a new dimension to our cities. Without them, few buildings would be more than 60 feet high because people display a marked reluctance to climb more than five flights of stairs.

Barring such events as a bomber going through a building and cutting both the

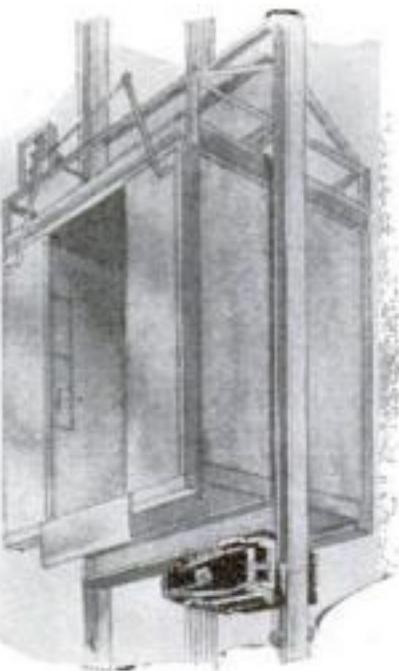
hoisting cables and the governor cables, accidents are rare. Cables are made from five to fifteen times stronger than they need be to carry maximum loads, and modern elevators have elaborate mechanical and electrical safeguards against all predictable hazards.

Each time a car moves, strong electrically actuated brakes stand ready to stop all movement of the hoisting sheave. The brakes are so designed that electromagnetic force is used to release rather than to apply the needed friction. Hence, an accidental current interruption involves no risk. Sometimes the hoisting motor is wound to give regenerative braking: that is, it automatically changes to a generator whenever it is

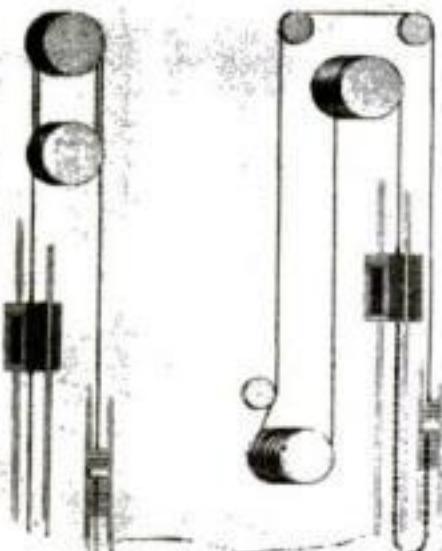
MODERN ELEVATOR SAFETY DEVICES



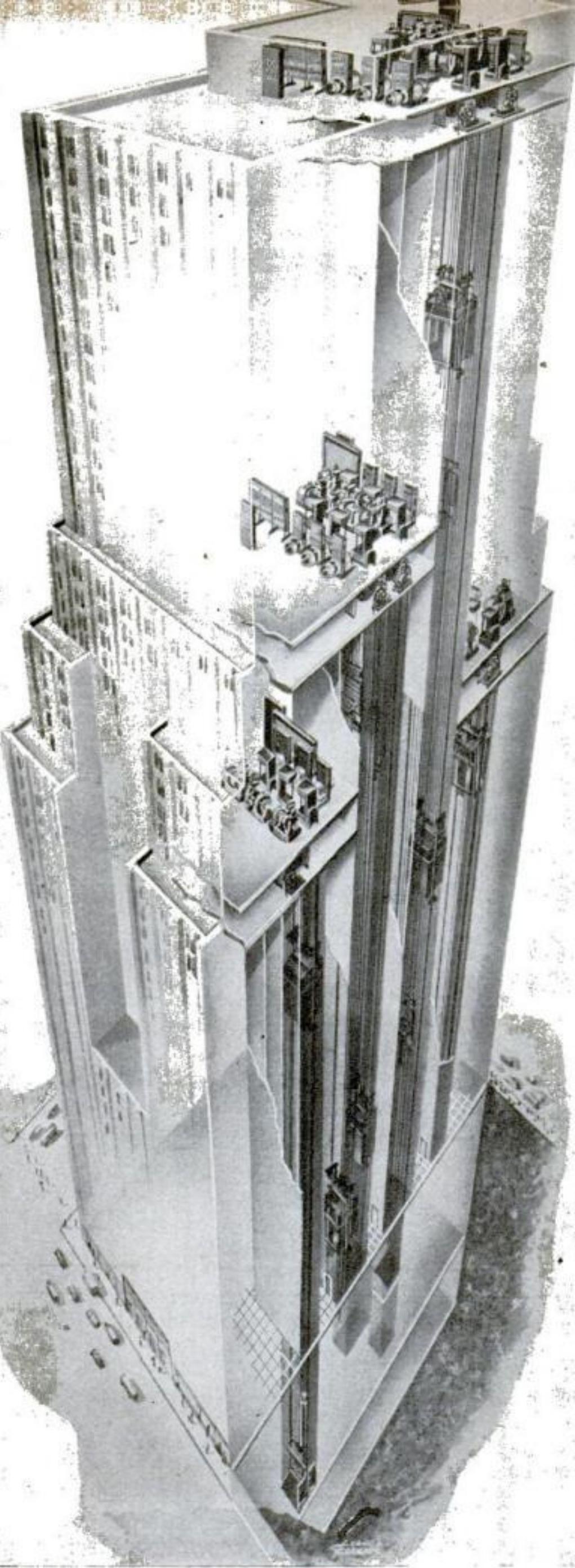
The overspeed governor works on its own separate cable. If a set maximum is exceeded, it slows the car.



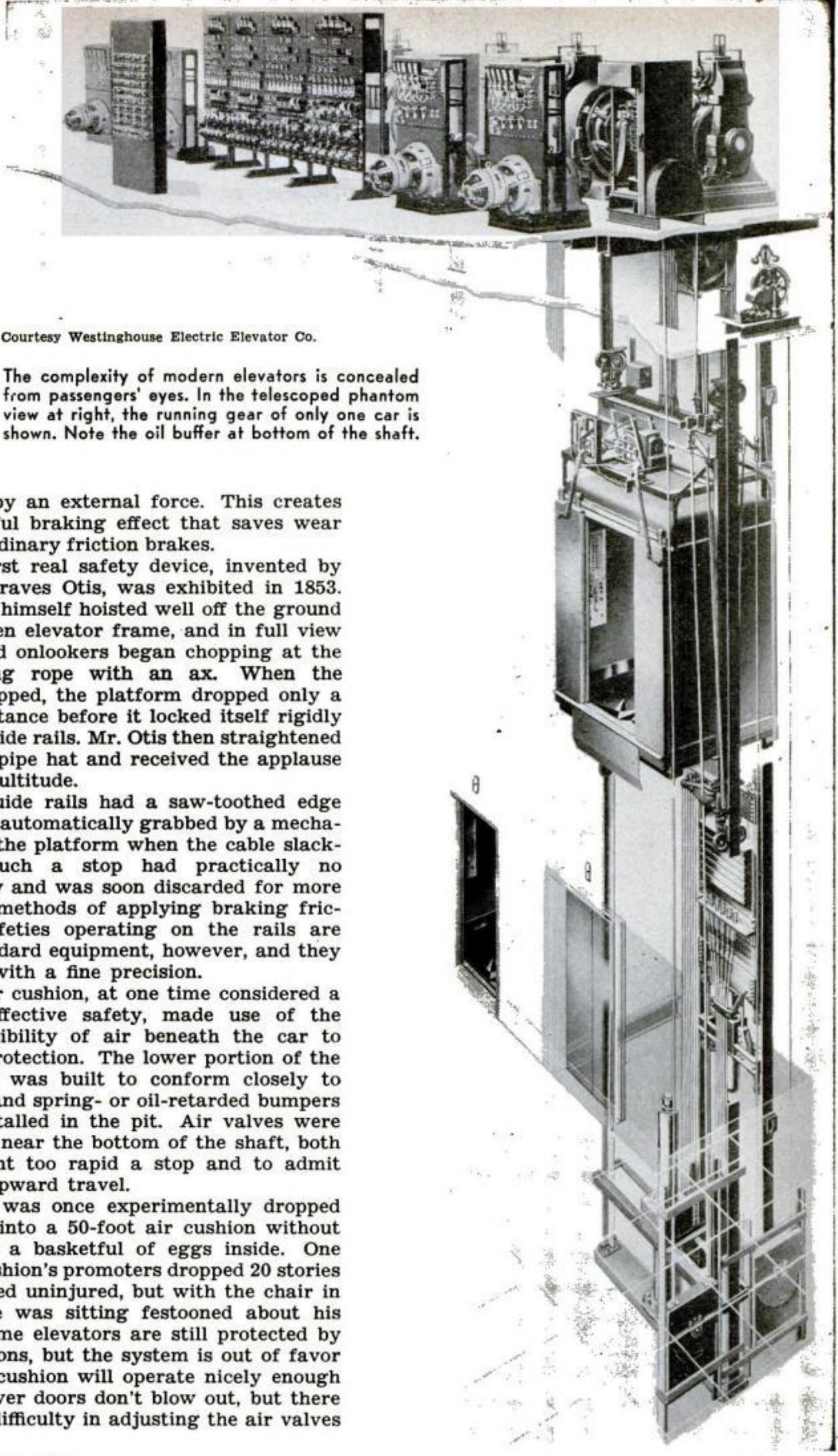
If the governor cable locks, this device beneath the car clamps powerful jaws against a rail, stopping elevator.



The traction drive, left, is contrasted schematically with a drum drive using power applied from basement.



Elevators made skyscrapers possible, but behind-the-scenes equipment and its space requirements limit the height of modern buildings.



Courtesy Westinghouse Electric Elevator Co.

The complexity of modern elevators is concealed from passengers' eyes. In the telescoped phantom view at right, the running gear of only one car is shown. Note the oil buffer at bottom of the shaft.

rotated by an external force. This creates a powerful braking effect that saves wear on the ordinary friction brakes.

The first real safety device, invented by Elisha Graves Otis, was exhibited in 1853. Otis had himself hoisted well off the ground in an open elevator frame, and in full view of hushed onlookers began chopping at the supporting rope with an ax. When the rope snapped, the platform dropped only a short distance before it locked itself rigidly on the guide rails. Mr. Otis then straightened his stovepipe hat and received the applause of the multitude.

The guide rails had a saw-toothed edge that was automatically grabbed by a mechanism on the platform when the cable slackened. Such a stop had practically no resiliency and was soon discarded for more gradual methods of applying braking friction. Safeties operating on the rails are now standard equipment, however, and they operate with a fine precision.

The air cushion, at one time considered a highly effective safety, made use of the compressibility of air beneath the car to give it protection. The lower portion of the hoistway was built to conform closely to the car, and spring- or oil-retarded bumpers were installed in the pit. Air valves were provided near the bottom of the shaft, both to prevent too rapid a stop and to admit air for upward travel.

A car was once experimentally dropped 287 feet into a 50-foot air cushion without breaking a basketful of eggs inside. One of the cushion's promoters dropped 20 stories and landed uninjured, but with the chair in which he was sitting festooned about his ears. Some elevators are still protected by air cushions, but the system is out of favor now. A cushion will operate nicely enough if the lower doors don't blow out, but there is some difficulty in adjusting the air valves

for all likely passenger loads, and for a stop that is both sure and not too sudden.

Since lifts attain speeds as high as 1,400 feet per minute (about 16 m.p.h.) nowadays, operators cannot readily "land" cars at specified floors by "inching," without wasting time and power. Consequently, cars are slowed to stops by an automatic floor selector, an intricate relay system that is capable of remembering all buttons pressed and dispatching a bank of cars as the buttons request. Another complex device, using selector tapes, vacuum tubes, or induction coils, then takes over and levels the car to a fraction of an inch. At the soonest safe moment during the "landing," the doors are automatically opened. Any slight changes in car level during loading or unloading are delicately and automatically corrected. A photoelectric cell prevents the power-closed doors from nipping an indecisive passenger. One recent elevator handbook remarks that "snappy operating equipment has the psychological effect of causing passengers to move quickly." Thus, even our behavior is being tampered with by the engineers.

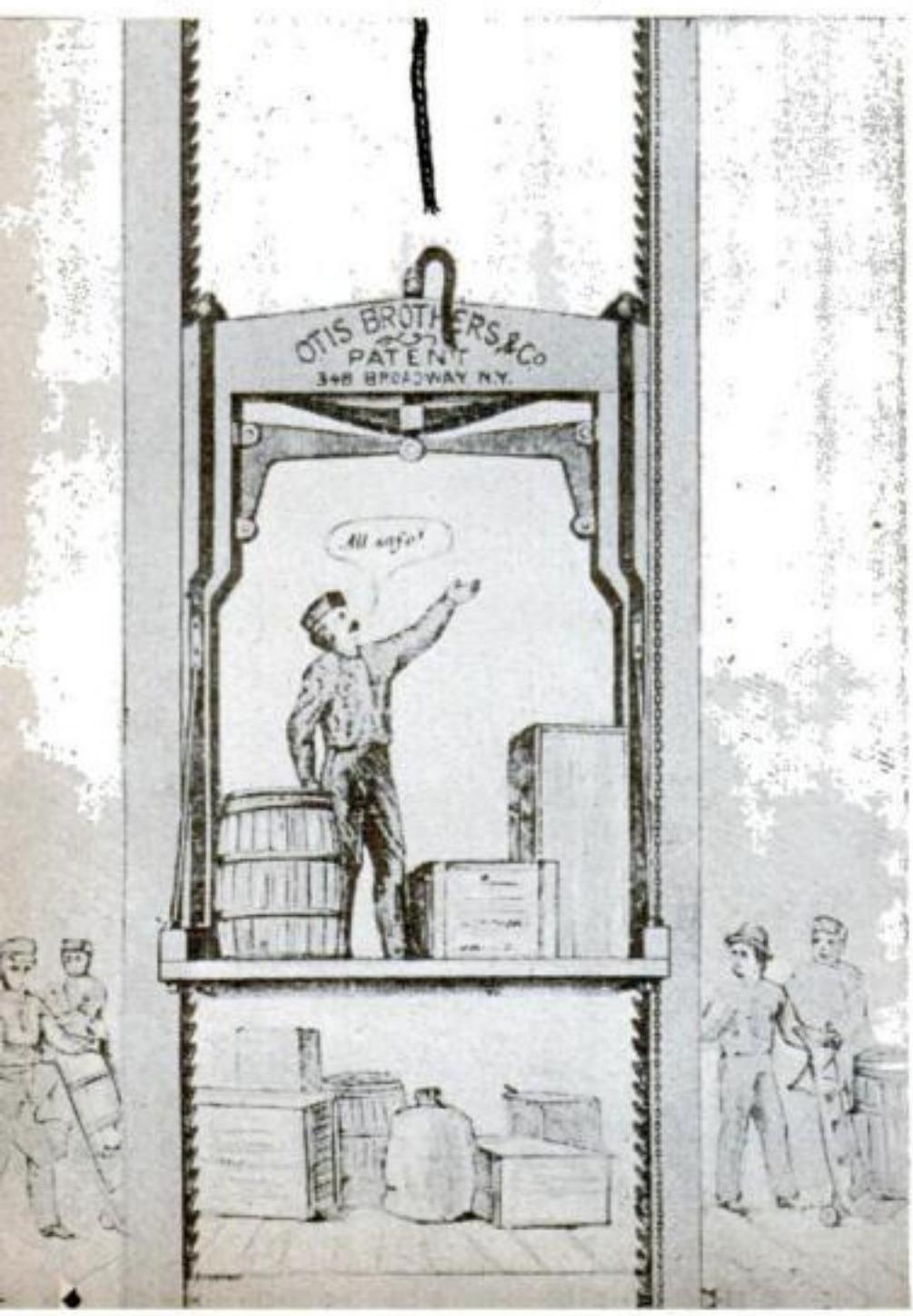
To save shaftway space, one New York building has experimented with double-decked cars, set in the same frame and fitted with interlocked controls. One passenger compartment stops at even-numbered

floors and the other at odd. Willfully stupid people, of course, take the wrong car. An even more advanced installation was tried in East Pittsburgh, with two independent cars running in the same shaft, protected from each other by red-and-green block signals.

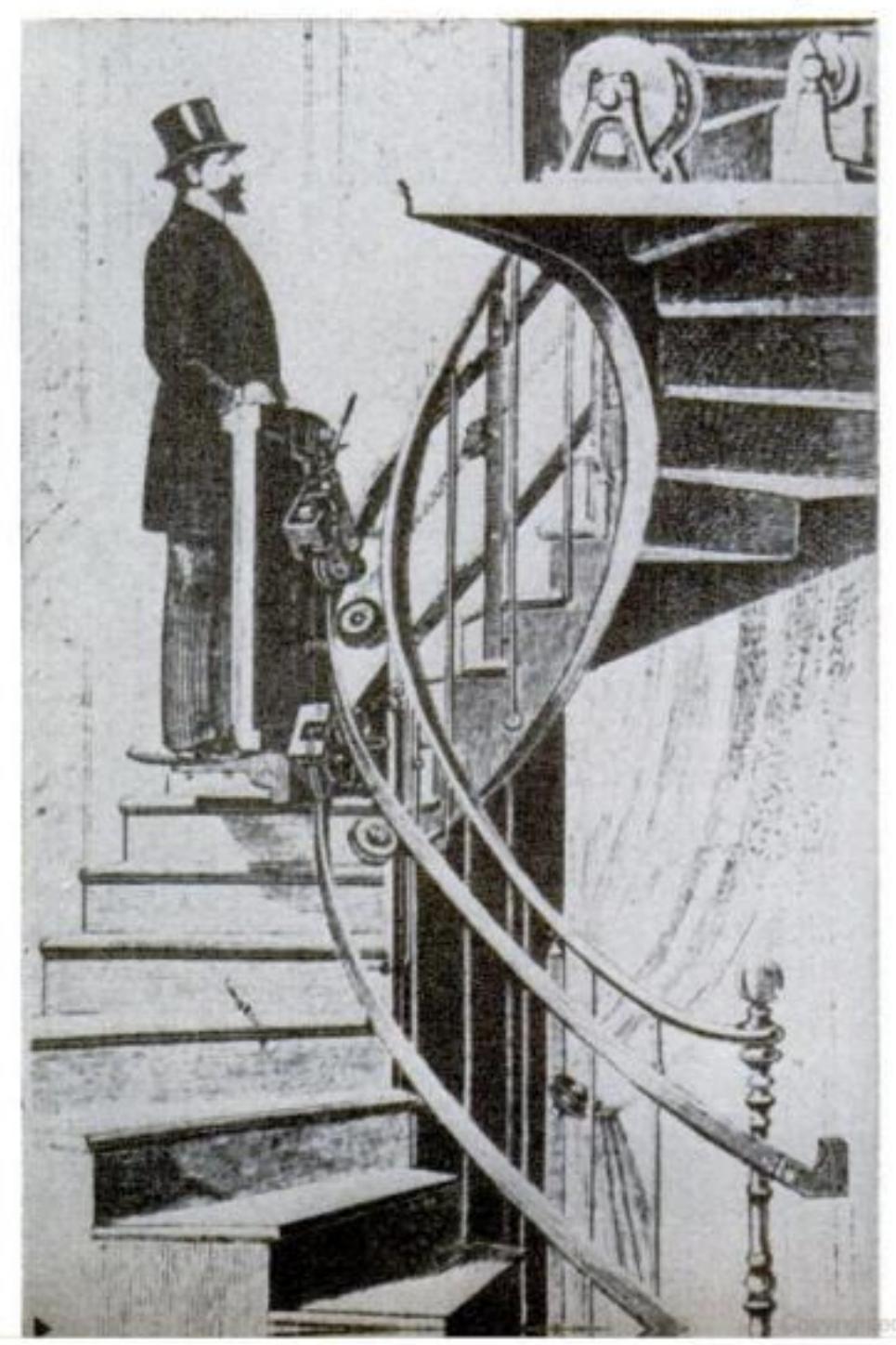
In some future skyscraper you may find continuous elevators that go up one shaft and down another, like buckets in a dredge. Another scheme on the drawing boards will locate a "focal load center" about halfway up a building. Fed by a bank of express elevators, this center will act as a terminal from which local trips can be made to specific floors. These lofty load centers may, in addition, be connected by bridges with similar centers in neighboring buildings.

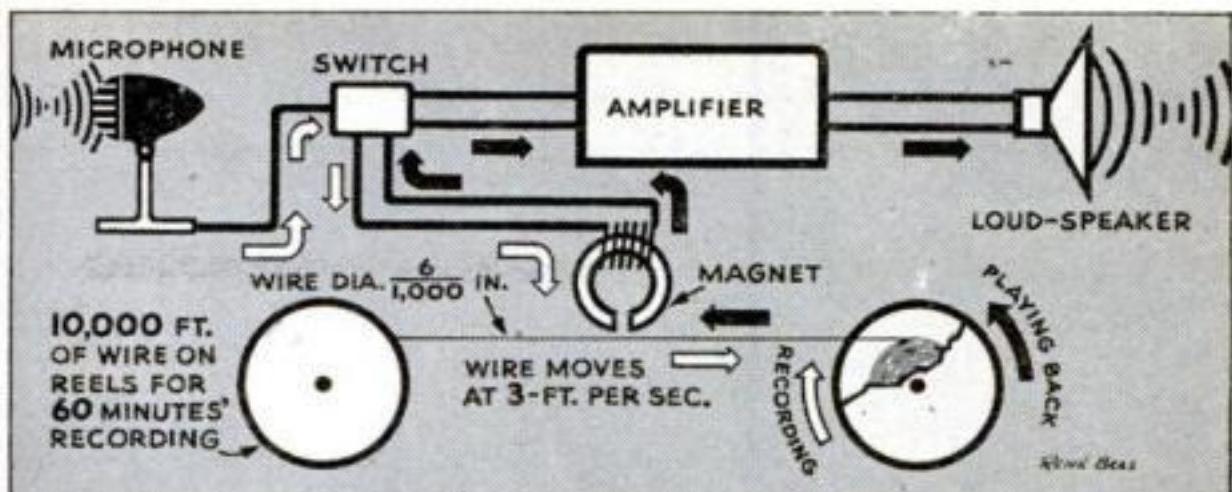
An elevator can, without causing discomfort, slow down about $1\frac{1}{2}$ times as fast as it can start up; and it can painlessly start upward somewhat faster than down. Most people can withstand an emergency stop of up to three times gravity without major injury, while twice gravity might leave you still standing if you had sturdy underpinnings. It's a pity that we can't withstand really high decelerations, because an elevator can theoretically start down so fast that the passengers would float down without touching the floor. (*Continued on page 206*)

If the hoisting rope of this early lift broke, saw-toothed guide rails were promptly engaged by metal dogs. The idea was patented by Elisha Otis in 1852.



The Frenchman ascending with such dignity is M. Amiot, who in the early nineties built himself this chain-driven escalator for use in a circular stairway.





Left, recorder in use. Above, sound is picked up by microphone, passed (white arrows) to magnet which magnetizes wire from reel. Magnetic field varies to match tone peaks. For playback (black arrows) wire passes through magnet, sending vibrations through to speaker.

War's Wire Recorder Now Civilian "Camera of Sound"

THE wire recorder was busy in the war making on-the-spot records of important goings-on that otherwise could not have been made. Transcriptions of epic events, of pilots' reports on combat and reconnaissance flights, and of enemy conversations wangled by Allied counter-intelligence agents made the machine invaluable.

Recordings are made by magnetizing a fine steel wire. The complete unit is compact, light in weight, and simple to operate. It can be built into modern radios, and has so many other possibilities it may well become a "camera of sound." Baby's first words can be caught and locked away. Sound tracks for the family movies and for sports events can be made. Famous sounds—Niagara Falls, Old Faithful, the President's voice—can be collected like autographs or stamps. Industrial and educational possibilities are as numerous.

The wire recordings play back with high fidelity, and can be stored without deteriorating. Lengthy recordings can be heard from

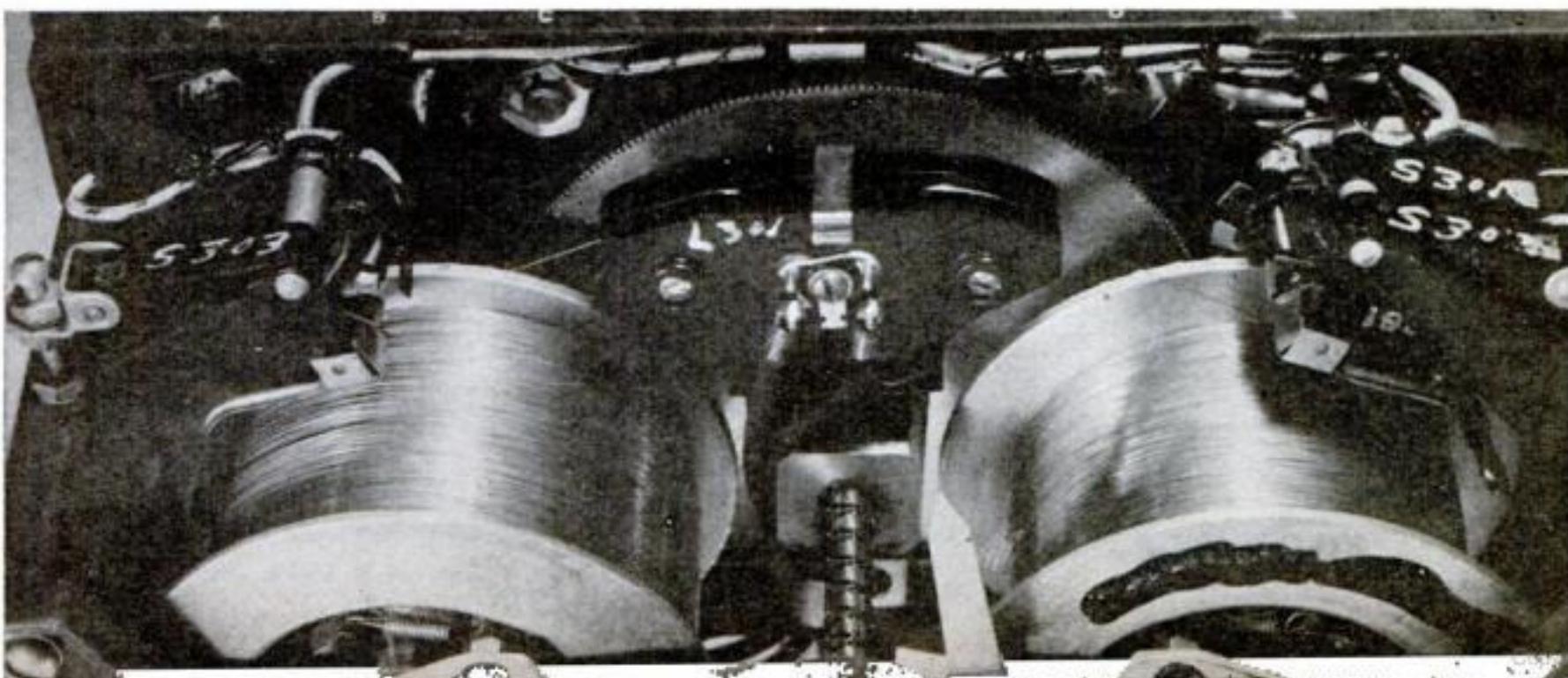
start to finish without interruption. A timer lets you play any particular portion. The sounds can be erased and new recordings made on the same wire.

The latest-model recorders can be carried in your pocket. Any type can be battery-operated for portable use.



George Hicks (left) used recorder in epic D-Day transcriptions. Here, he records in mid-Channel.

Inside the recorder: reels holding nearly two miles of wire, and magnet, are seen. Wire must be rewound before playing back, otherwise voice is heard in reverse, and sounds like Donald Duck. Selector unit has switches for recording, playback, erasing, and other functions. Recorder requires no attention after starting.





"Sound Collision Quarters!" Ships cannot be stopped like automobiles; they must be handled skillfully in that minute of danger and decision to avert crashes like this one between a battleship and a transport.

COLLISION AT SEA

**Young Skipper's School Reduces the Peril.
13,000 Crashes in War Are Costly Lessons**

By LEON SHLOSS

THE Japs tried desperately for three and a half years after Pearl Harbor to put an American battleship out of action—and failed.

Where the Japs failed, the Americans succeeded. We put not one, but two of our own most modern dreadnoughts out of action in a few brief, terrible moments at a critical phase of the war—because we had no scientific method of avoiding ship collisions.

Nearly 150 times during World War II the Navy lost, forever or temporarily, vital warships as a result of collisions. The Merchant Marine suffered as many as 10 collisions daily. There were nearly 13,000 collisions in all. They cost a billion and a half dollars, hundreds of lives, and irretrievable time. But the Navy found a way, largely through the efforts of a young reserve officer, virtually to eliminate ship collisions before the war's end.

COLLISION CASUALTIES	
	4 aircraft carriers
	7 battleships
	2 medium carriers, 1 baby flat-top
	2 heavy cruisers
	45 destroyers
	14 destroyer escorts
	12 cargo, transport, oiler types
	30 LSTs (landing ships, tank)

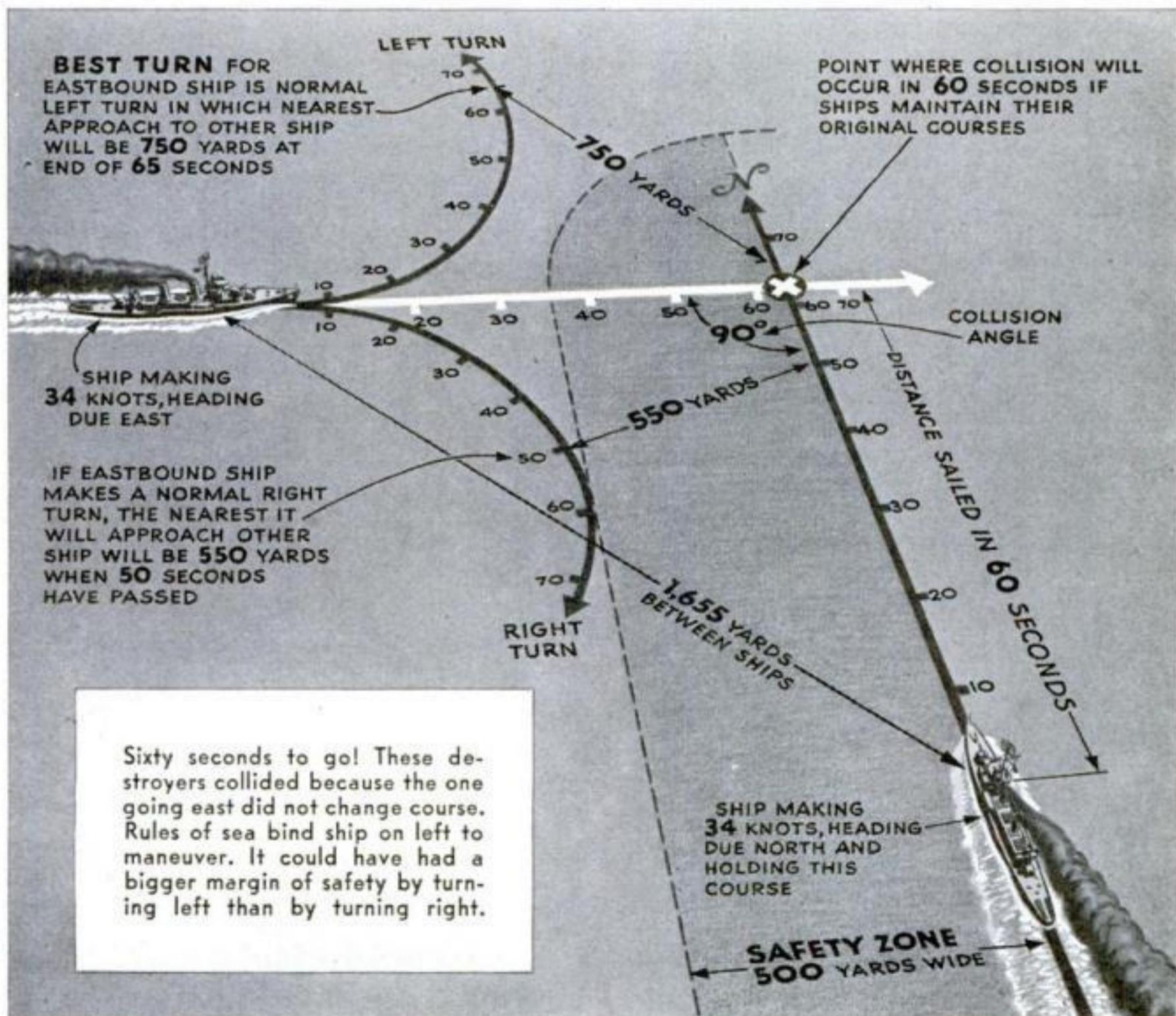
The collision that denied the services of two badly needed battleships to the Pacific Fleet sparked the events that remedied the situation. This collision occurred in February 1944, right after we had taken Kwajalein. Saipan, Tinian, Guam, the Palaus, and the Philippines were to follow, but for many anxious weeks after this accident, high-echelon councils wondered whether the scheduled offensive should be continued without the two battlewagons. Battleships, at that phase of the war, had just been robed with a new importance. It had been discovered that these monsters, given a main deck full of antiaircraft guns, could provide a steel shield under which aircraft carriers, spearhead of the fleet, could move within excursion-boat distance of enemy shores.

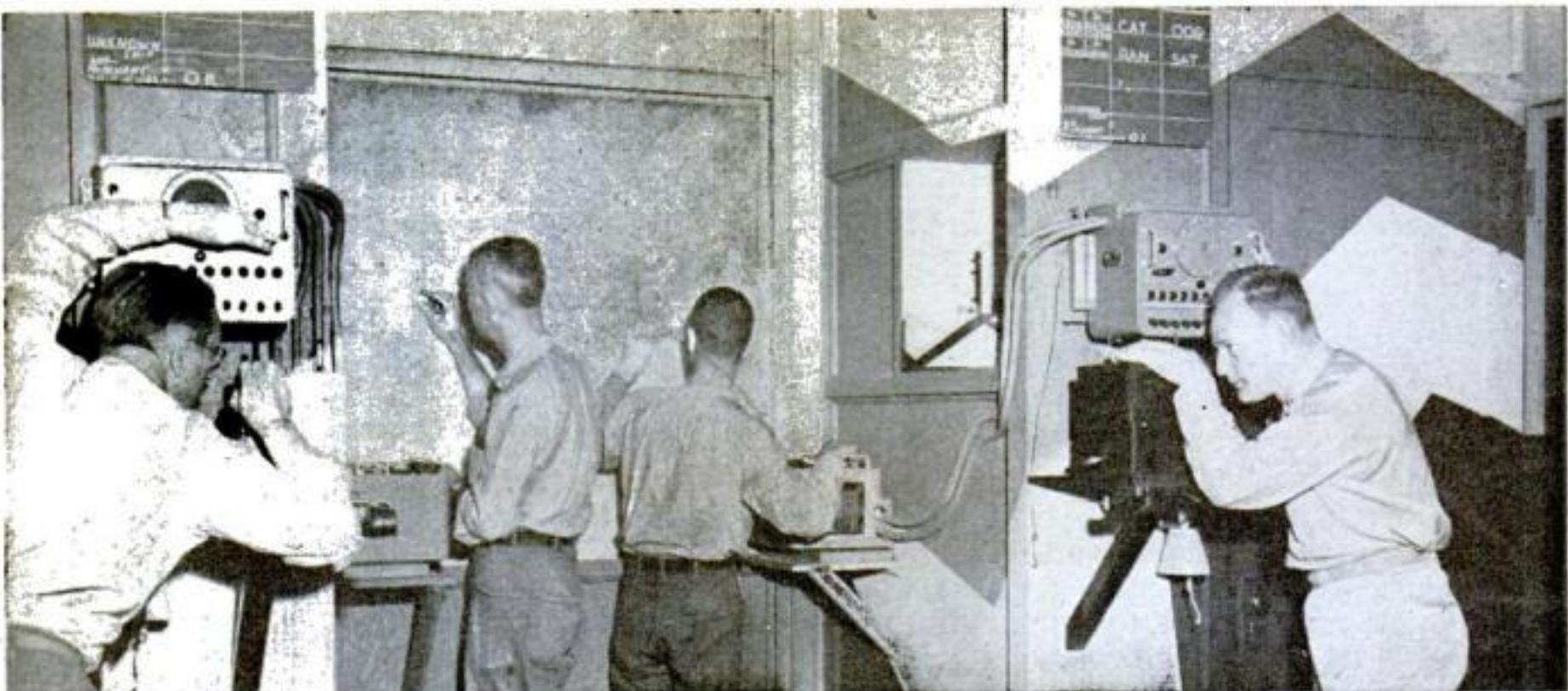
The two ill-starred battleships were, in fact, tantalizingly close to the Jap homeland when the setback occurred. The Fast Task Force in which they were operating was looking for trouble. It found it, however, in a most undesirable shape, the shape of its own ships. At four o'clock in the

morning, Battleship A was ordered to leave the formation. She started to pull off to the left, when her radar picked up a group of ships on her port side, on a collision course. So A came right, in an attempt to cross Battleship B's bow. When the captains of the two ships realized they were on a collision course, they resorted to the then-current collision-prevention doctrine of turning toward each other's stern. Battleship B got her bow knocked off in the ensuing crash, and was out of action for many weeks. Battleship A was damaged and was out for a lesser time. At least six men lost their lives.

Under the system evolved after this tragic mishap, Battleship A, by pulling ahead for some distance before turning out when ordered to leave the formation, would have avoided the collision.

The new system was part of the revolution in naval warfare that was necessitated by World War II. The Navy's fleet, at Pearl Harbor numbered in hundreds, contained more than 90,000 units by V-J Day. The old fleet line, moving majestically, was



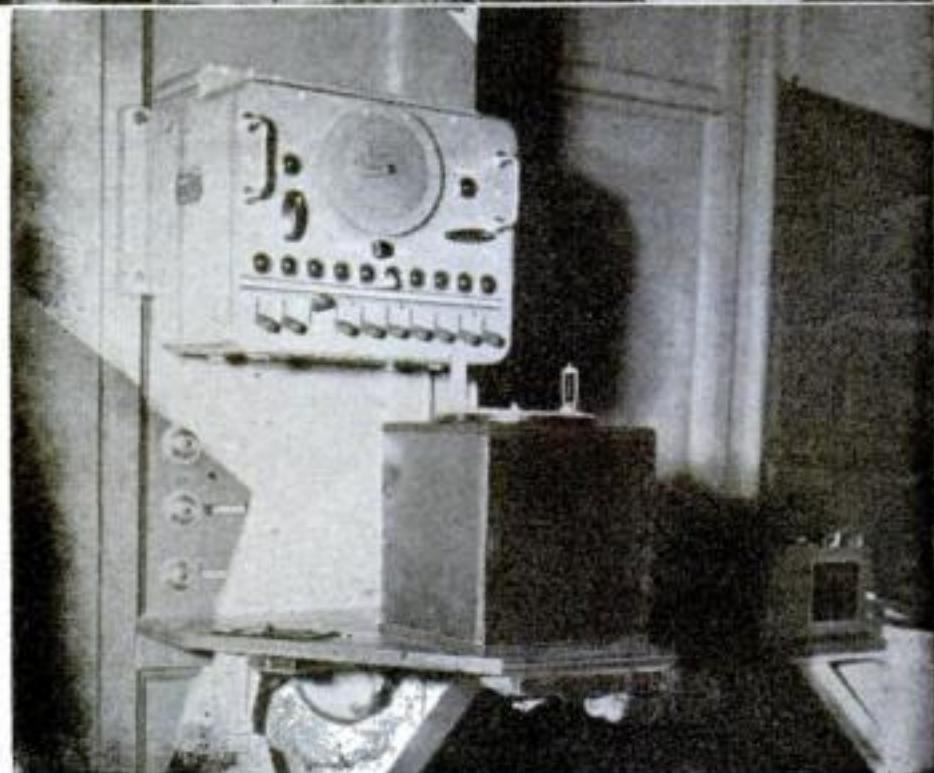


At the Navy's Emergency Shiphandling School, Junior Officers of the Deck (JOODs) use synthetic devices to sight on model ships, then relay their bearings to Officers of the Deck (OODs) up on the "bridges." Radar plotters (center) chart positions.

replaced by the Fast Task Force. This force numbered hundreds of vessels, bows splitting swells at 20 to 30 knots, often engaged in violent evasive maneuvers to confound the enemy's radar-controlled gunfire, rocket and torpedo attack by aircraft, submarine wolfpacks, and all the other new weapons of war. The old preradar doctrine of avoiding collision, based on "when in danger, turn toward the stern of the other ship," just wasn't working, and it wasn't working so often that, following the battleship accident, then Fleet Admiral Chester W. Nimitz called attention to the mounting collision rate in a letter to the Pacific Fleet and made it incumbent on all commanding officers to give renewed consideration to the fundamentals of safe maneuvering.

Not only was the number of collisions disturbing, but so was the nature of many of them. On a black night in the far western Pacific a ship, with newly installed

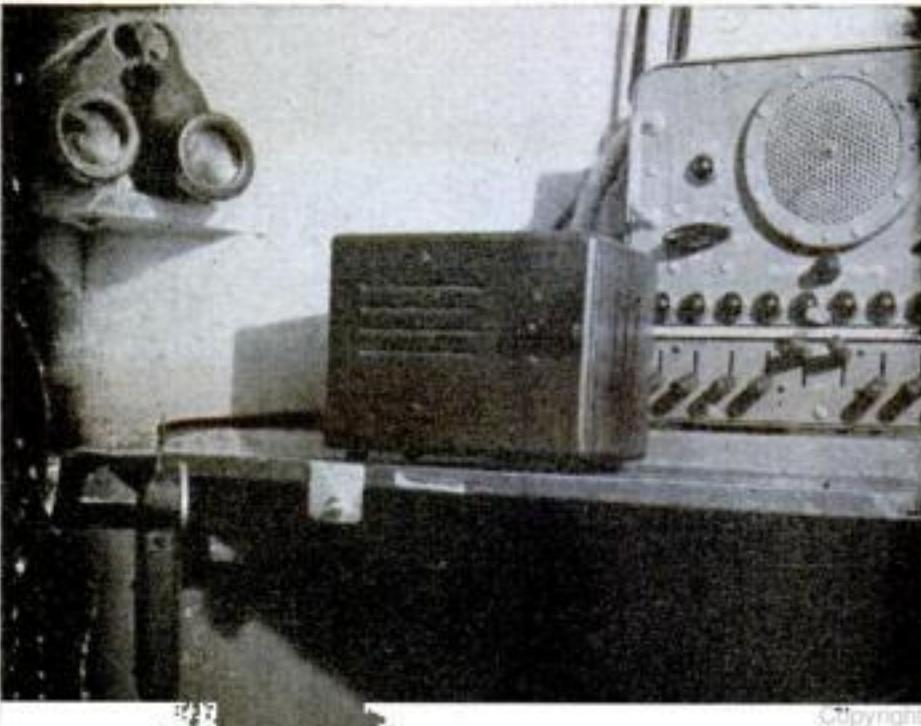
Up on the teacher-ship bridge, an OOD sights on a model ship through reversed binoculars to create the illusion of distance. Ship's helmsman is at right.

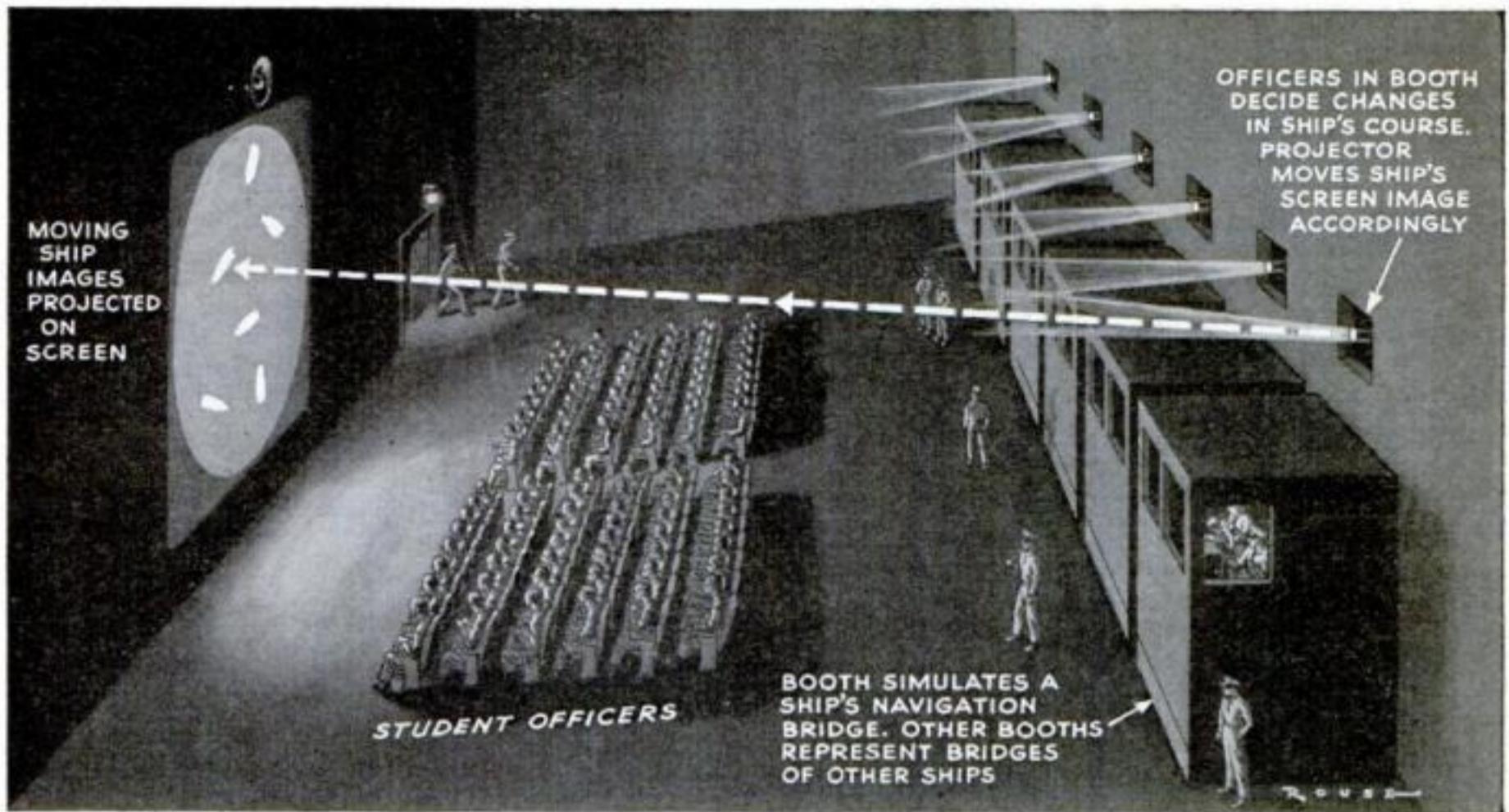


A JO's equipment includes the communications unit on the wall for talking to the bridge, whistle button, captain's call button, siren, and ship's bell.

radar, picked up an approaching vessel at 33,000 yards. Engrossed with their new instrument, the Radar Plot crew tracked the other ship with amazing accuracy—right up to the moment the two ships met head-on. In their absorption, they had neglected to inform the captain that another

Here's an OOD's equipment: reversed binoculars, talk-between-ships radio, ship's intercommunication unit, and microphone to record talk between ships.





Auditorium-size classrooms are planned for future shiphandling schools, founded by Lt. Comdr. Davis N. Lott. Students watch ships' images, projected onto screen electronically as ordered by OODs in the booth "bridges," maneuver in convoy and task-force problems. Twelve-ship schools, like the above, are planned.

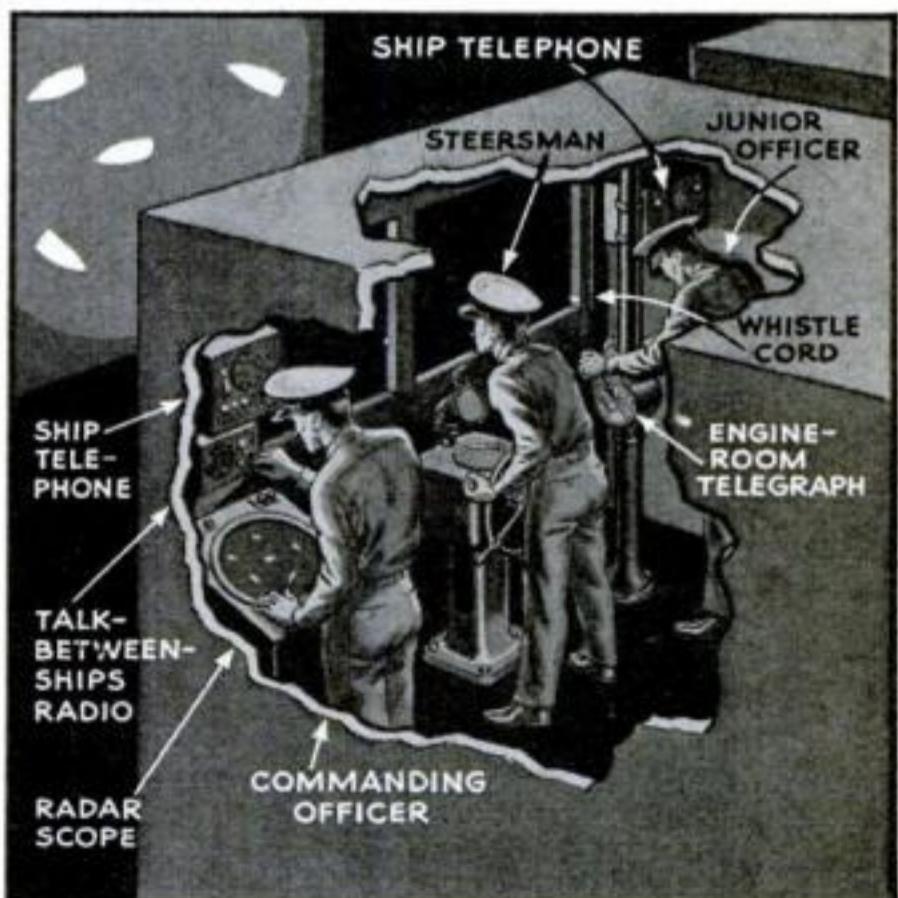
ship was approaching with a closing range and a steady bearing—the two danger signals which experienced officers know spell "COLLISION!" The two vessels had been on a perfect collision course for 17 miles!

On another dark night, two destroyers were screening a Fast Carrier Task Force. Both captains were snatching forty winks in their sea-cabins. Running on a parallel course, the formation was ordered to commence the zigzag plan at 20 knots. Ship A came right, while Ship B—which had failed to receive the radio order for zigzag—continued on a steady course. The next zig sent Ship A away from B. Then B noticed what its deck officer considered A's *apparent* difficulty in holding course, so B came left in an effort to maintain station. A zipped right and actually passed astern of B, placing A starboard of B. The conning controlling officers of the ships then were looking for each other's vessel on the wrong side! A's next zig pointed her bow directly at B's beam. B failed to sight A until the range was 300 yards. A never did sight B, as she was still looking for B on the wrong side. B used rudder and engines to avert collision, but sounded no whistle signals and used no lights. B's TBS (Talk-Between-Ships radio) was inoperative, so she couldn't warn orally. A serious collision resulted.

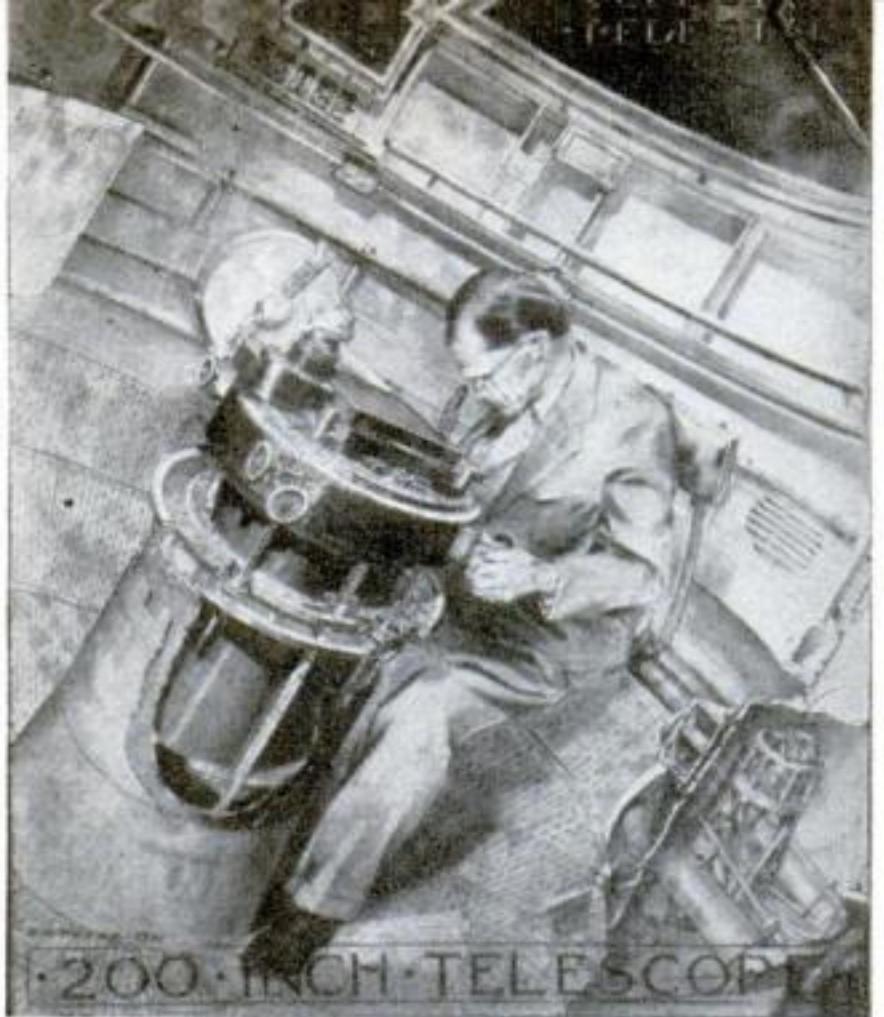
At the time Admiral Nimitz's letter on avoiding collisions was circulated throughout the Pacific Fleet, the records were full of collision cases where conning officers had

erred either in commission or in omission through failure to utilize all their tools, such as radar, lights, whistles, and radio. Aboard the minesweeper U.S.S. *Clamour*, 32-year-old Lt. Comdr. Davis Newton Lott, the skipper, who had interrupted a movie-radio career to fight the Axis, read the Admiral's letter, and set to thinking.

Lott had written two naval texts dealing with ship recogni- (*Continued on page 207*)



Inside a "bridge" of the proposed school, an OOD watches maneuvering ships' images on the radar scope. JO, right, transmits orders to engine room.



LOOKING DOWN into the telescope's eye, the observer may focus it on stars a billion light years away. Cylinder supports a double-slide plate holder.

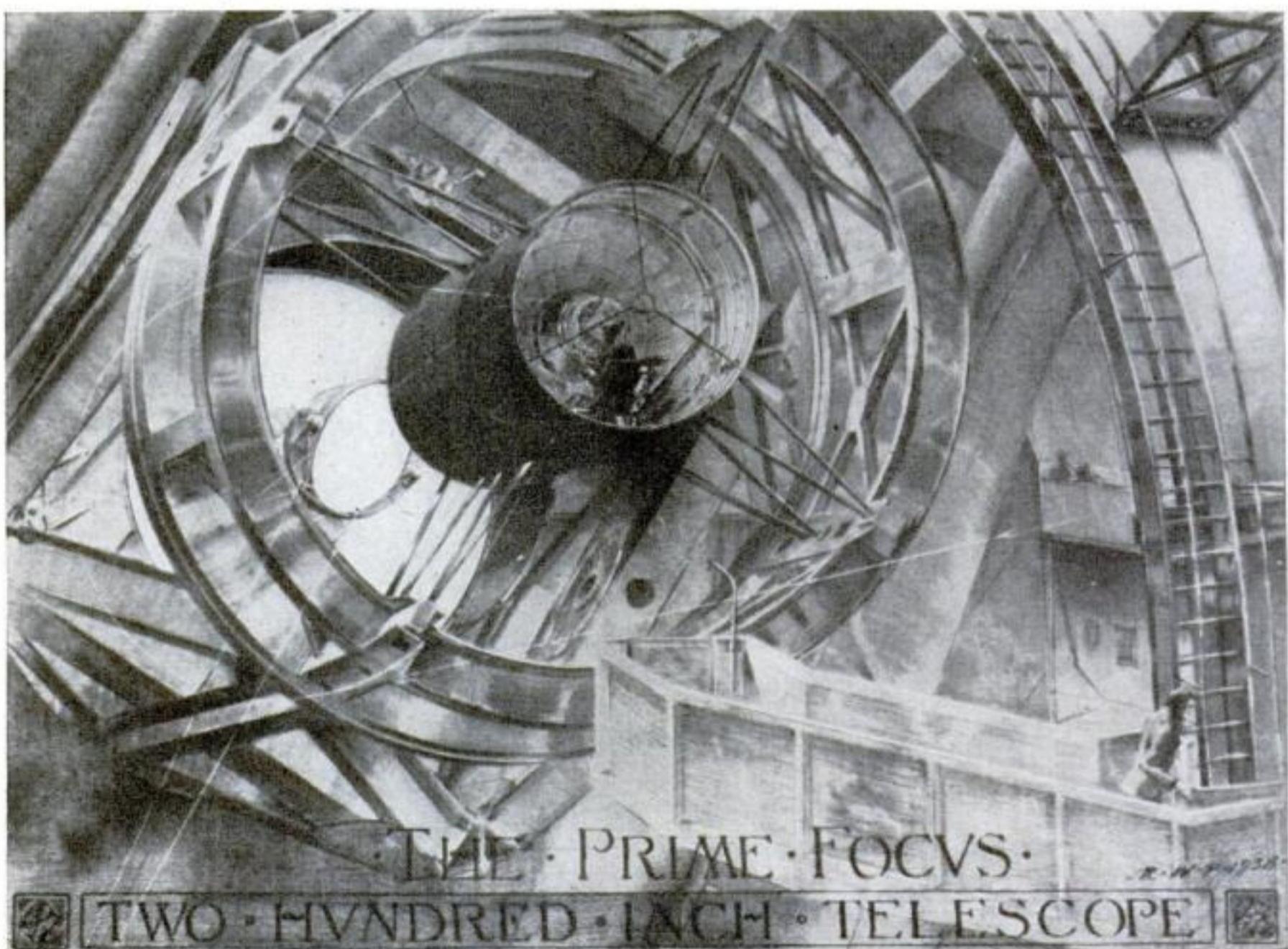
A MOVABLE BRIDGE, riding on a curved track, will take the astronomer to and from the prime focusing point at upper end of the tube. Huge mirror reflects light to photographic plates.

INSIDE THE

THE great 200-inch telescope of the California Institute of Technology on Mount Palomar in southern California is now scheduled to go into action in about 18 months. World War II, draining the nation's scientific talent, abruptly halted the construction of the biggest spyglass in the world. Now, experts have resumed the task of completing it. The cover of this issue of POPULAR SCIENCE MONTHLY shows how the instrument will look. A dome 10 stories high will house it.

To give an idea of the power of the 140-ton tube, it would make New York's Empire State Building visible from the moon, in the absence of intervening clouds and haze. New light will be thrown upon the possibility of life upon our neighbor planets. To astronomers, one of its most interesting uses will be to discover almost inconceivably remote galaxies or universes. For comparison, our own galaxy is the Milky Way, in which the sun is a typical star.

In theory, since the light-collecting power increases according to the square of the diameter, the Palomar instrument should



WORLD'S BIGGEST EYE

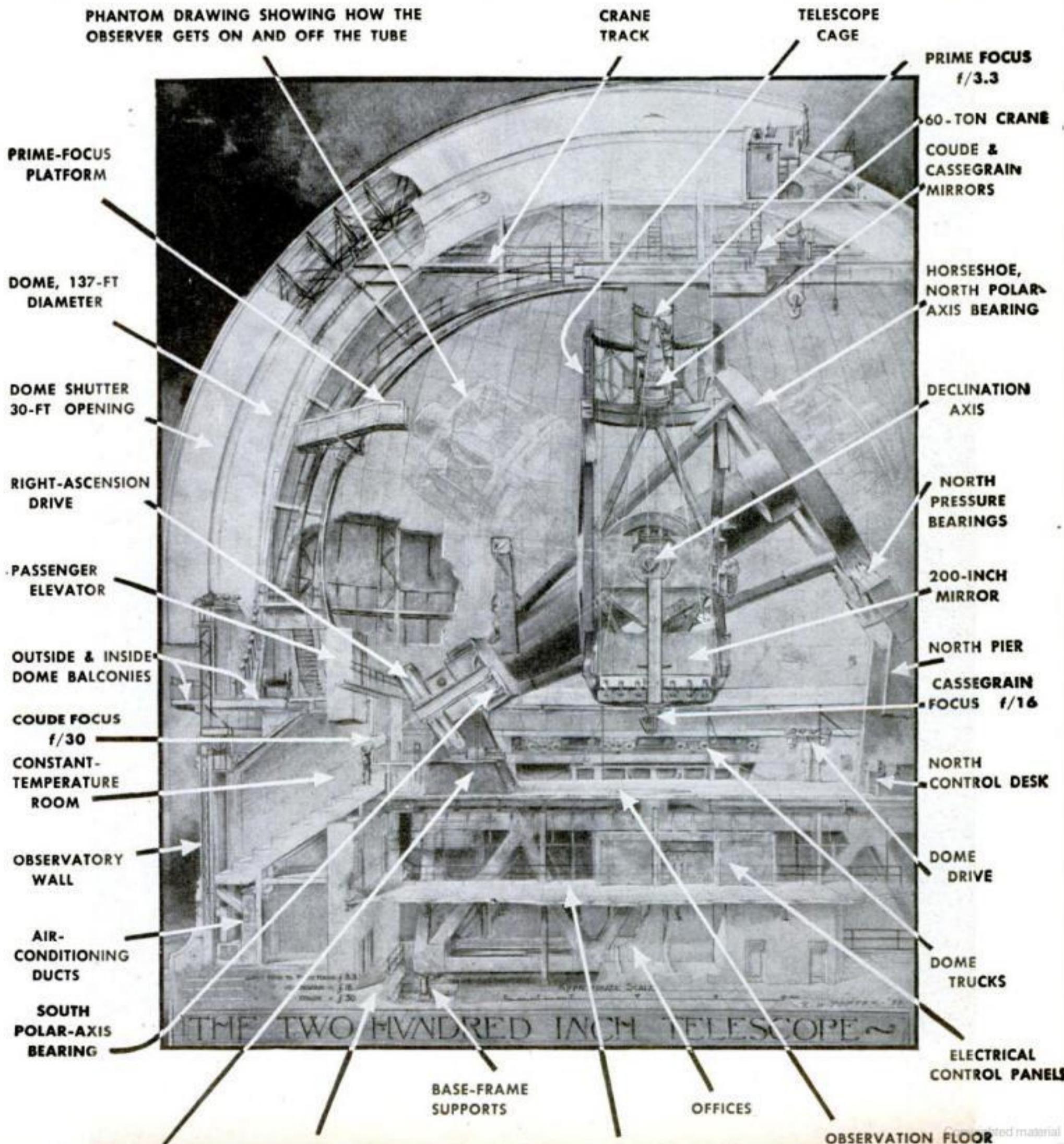
prove four times as powerful as the 100-inch Mt. Wilson telescope in current use. Actually, later refinements in steady mounting will probably better the figure. This becomes especially important in taking long "time-exposure" pictures of faint stars.

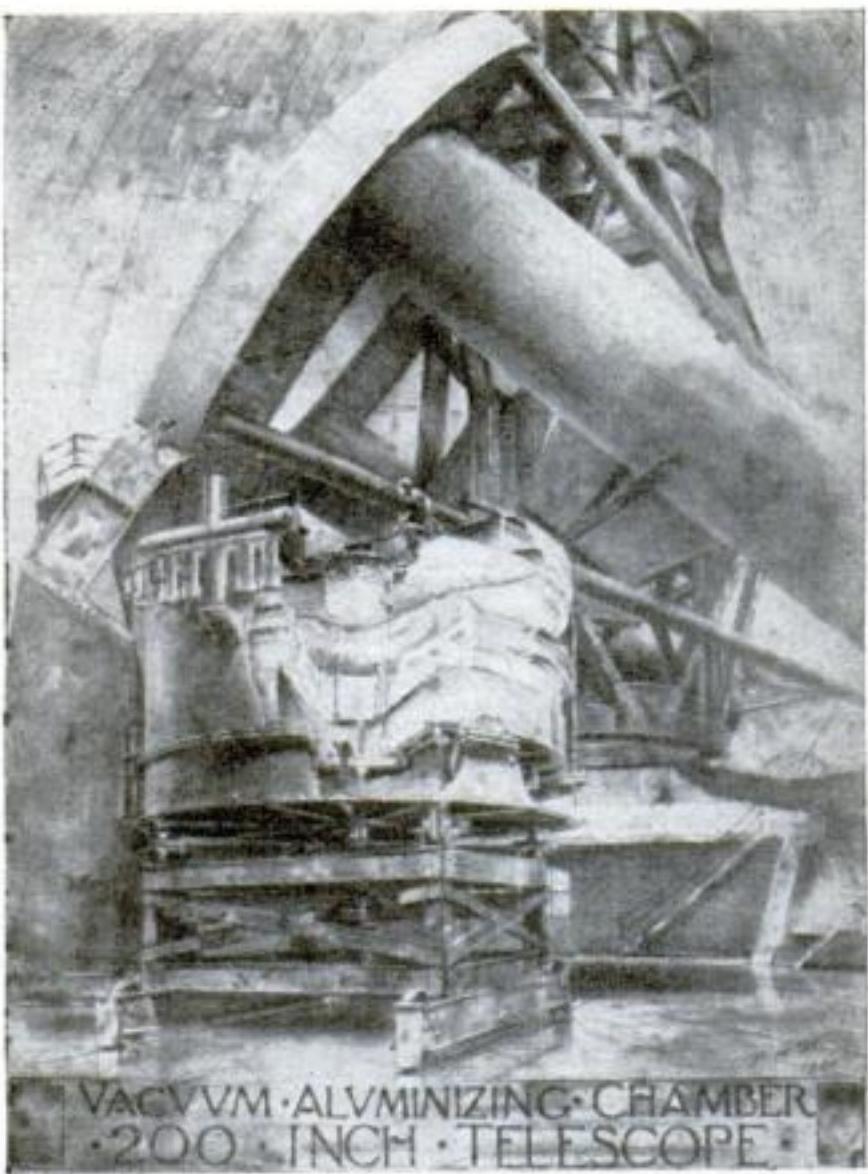
Observers at Mt. Palomar will rely almost exclusively upon photographs for their

records—for the eyes of different people do not always see alike. Some see canals on Mars. More skeptical stargazers believe that the markings of the red planet are exaggerated and joined by the imagination of the viewer, much as the ancients saw wild beasts and mythological characters in constellations or star groups and recorded

A TEN-STORY DOME will house the 200-inch telescope. The dome weighs 1,000 tons and the instrument 500 tons. Cutaway sketch shows the principal features and three of the positions of the upper end of the 140-ton tube. These drawings were made by Russell W. Porter of California Institute of Technology.

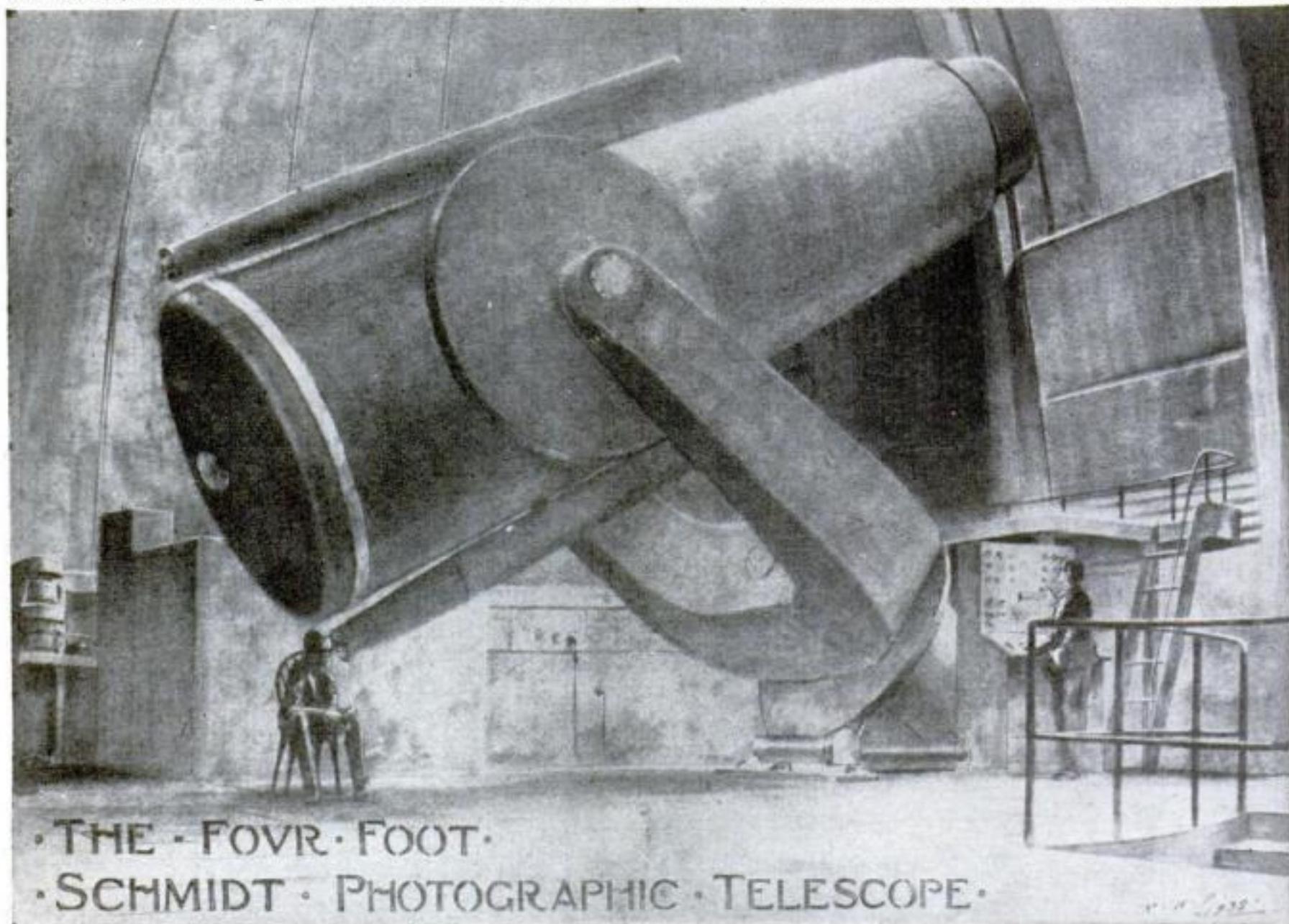
PHANTOM DRAWING SHOWING HOW THE OBSERVER GETS ON AND OFF THE TUBE





MIRROR SURFACE of special aluminum may be renewed at the site. Mirror will not vary from perfection by more than two millionths of an inch.

SCOUTING TELESCOPES will find objects worthy of the great eye's time. This one will photograph an area 3,000 times greater than 200-inch giant. Note guiding telescopes above and below camera tube.

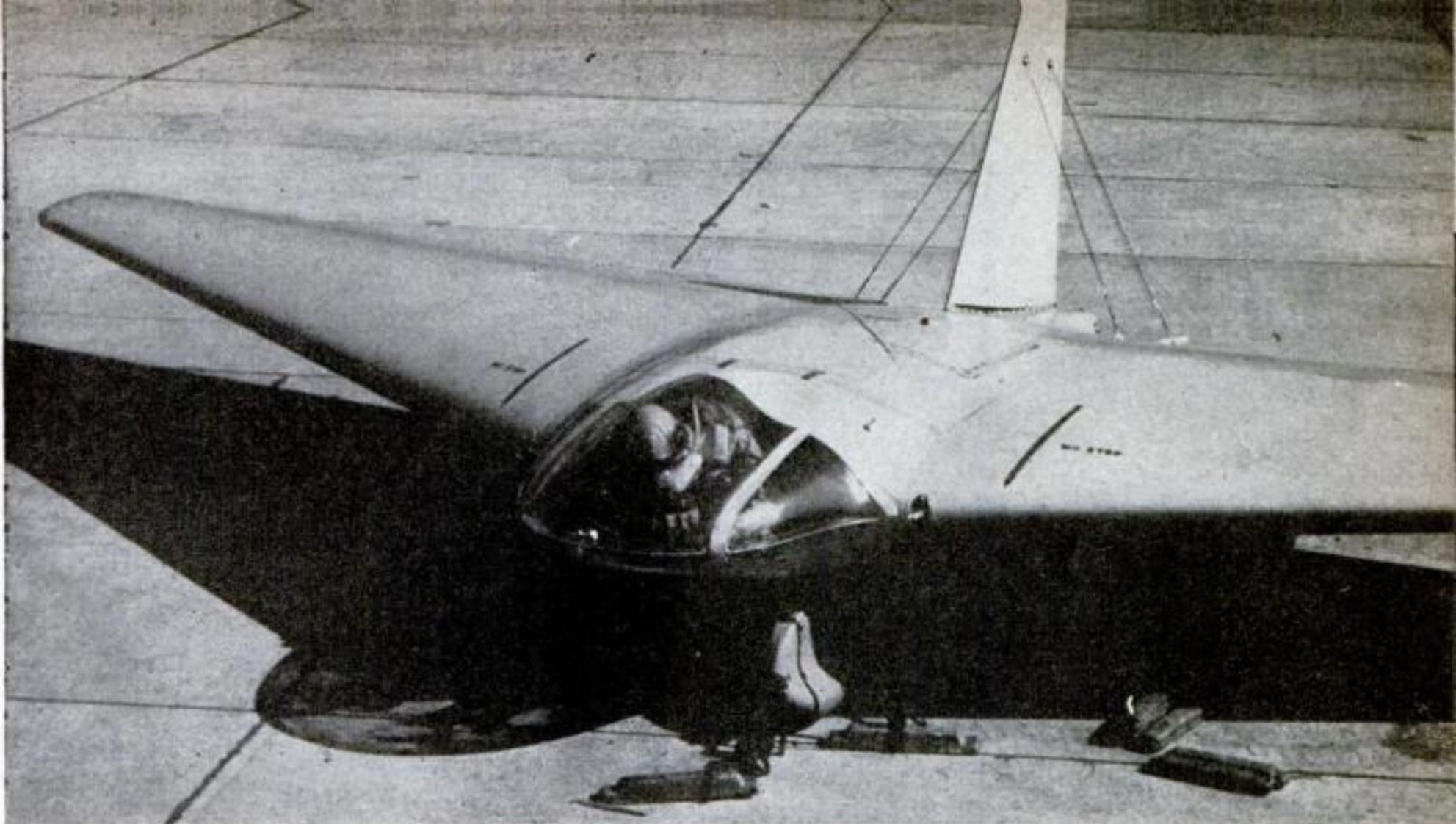


them on the decorative charts of the day.

To obtain its enormous magnification at its principal focus or observing position, the sky camera receives a cone of light only one fifth to one third the width of the full moon. Therefore, smaller "pilot telescopes" direct the big one. Carefully balanced, its barrel rises and falls, and the whole dome revolves with it, virtually without friction, on films of oil forced through bearing pads.

Not only will stars and nebulae pose for their pictures, but their light will be transformed into a spectrum or rainbow, permitting the observer to see what they are made of. Celestial events, such as the birth of novae or exploding stars, will be filmed as they occurred in prehistoric times, since photographs will pick up stars so far away that their light takes 1,000,000,000 years to reach the earth.

Like other great telescopes, the one at Mt. Palomar employs a concave mirror to form an image. Varying the optical system provides a number of observing positions, including those familiar to astronomers as the prime focus, the Cassegrain focus, and the Coudé focus. These are indicated in an accompanying drawing, together with their speed rating in the "f" system in general use by photographers. Low numbers mean short exposures.



"Motorcycle of the Air" Used In Jet-Fighter Research

ROCKET-propelled "Project 12," previously a Wright Field secret, is a novel flying-wing design in which the pilot lies on his stomach, his chin on a V-shaped rest, and looks out through a Plexiglas nose faired into the wing's leading edge. In the prone position he is best able to tolerate the increased accelerations which great speed entails. Built by Northrop, the wing blazed a trail for the hot new XP-79, jet-propelled, flying-wing fighter.

Controls of "Project 12" are hooked up to a handlebar. When the handles are upright, control surfaces are neutral. Pilot bends the handles forward to nose down, backward to nose up, and to right or left to bank the wing. To turn, he moves the handlebar as if he were steering a motorcycle. The throttle is within easy reach of his left hand; other switches are near his right. The pilot enters the wing through a hatch in the top, which has an automatic opening device for emergency bail-out.

Floods Are Made to Order In Scale-Model Valley

FLOODS rise and fall at the flick of a switch on this electrically operated scale model of a dam and river valley. Arkansas Power & Light Co. built it to show the Southwest why flood-control dams need empty reservoirs to store water and let it out gradually; why power dams must have full reservoirs and therefore are not useful in the control of floods.



"Project 12" is easy to fly, test pilots found, after a little practice. The unusual flying wing has fixed, tricycle landing gear and bellows-type flaps (above).





Every meet of the Motor Sports Club of New York features cars of many foreign and American makes.

SPORT MOTORING

Driving pet cars in races of skill is fun for this new club.

TO MEMBERS of the Motor Sports Club of New York, the automobile is more than transportation; it is a hobby and a sport, much as it was in the early days of gas propulsion when a car was a family pet. Most of the cars so lovingly tuned and polished by their owners are of foreign make, but there are some standard American models too. The chances are that pretty soon somebody will come along with a jeep, and, more than likely, he'll make Club history.

On a typical week-end meet the boys and girls (about half as many women as men belong) rendezvous in the Plaza at the south end of New York's Central Park. As each of the heavily powered jobs arrives, a new motor tune can be recognized. A dinky jewel-like English Standard Swallow takes its place beside a stately Rolls Royce, and

a Delage from France touches bumpers with a low-slung Italian Lancia. There is a 1928 German Mercedes, and an American Hudson with a 19-foot custom body. In line with their sporting instincts, the Club members go in for picturesque cars.

The scene of the meet may be in Great Barrington, Mass., Westport, Conn., or some abandoned airfield on Long Island, wherever a couple of acres of open ground is available. Sometimes the convoy arrives in the evening; then members nose their cars into a large circle around a campfire and talk superchargers, high-octane gas, and whatnot while supper is cooking.

In the morning comes last-minute grooming. Amateur mechanics change spark plugs, adjust timing, tinker with carburetors to get the best possible performance for altitude and climatic conditions. The



Members meet in front of the Plaza Hotel, New York.

At night the cars gather around a big campfire.



They make a brief lunch stop halfway to the meet.

Last-minute adjustments are made before the start.





Neighborhood kids get a great kick out of the fun.

course to be run is laid out and handicaps given each car. A succession of events is staged to test the skill of the driver as well as the response and stamina of his car.

The contests involve sharp turns, backing up, and a complete loop, to say nothing of the driver's having to stop, get out, and run around his bus before continuing. An event may end by the cars weaving around stakes in a roaring dash to the finish. One of the most popular contests is the "bang and go back" race, in which cars line up, and, at a given signal, tear straight ahead for 100 yards, stop, and then in reverse go back to the starting point.

Handicapping is figured on wheel base, since the larger cars have more difficulty than the small ones in turning and backing. Three seconds are allowed for every five inches of wheel base over the shortest scratch car. Incidentally, in a recent obstacle race a big Rolls Royce finished fifth,



A girl expertly handles a 100-hp. Standard Swallow.

while a little old Ford came in just after the winning Italian Lancia. This emphasizes the fact that the Motor Sports Club of New York is not a high-hat organization. There is no initiation fee, and there are no dues. All one needs is a car, a keen interest in the sport, and the price of a dinner at the restaurant where the occasional meetings are held. The president of the club takes care of notifying the members when get-togethers are planned.

This kind of sport driving need not be expensive, for any type of car from a jalopy to a truck may be used. The skill of the driver is as important as the size of the car. It can be exciting without danger. There have been no serious accidents among the contestants at Motor Sports Club gatherings. Members claim that more of these motor sports clubs throughout the country would help to raise driving standards, lower automobile accidents.

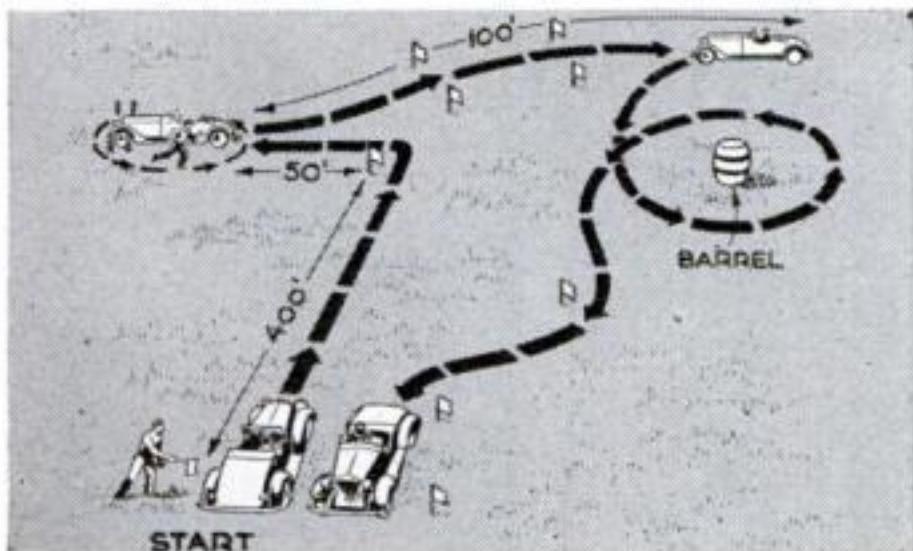


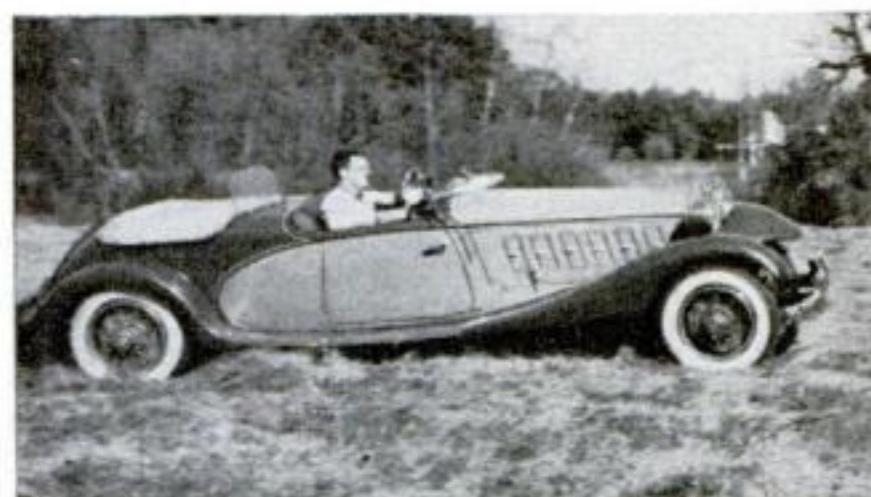
Diagram of course used in meet. Flags denote turns.



British Invicta backing in a "bang and go back" race.



This 19-ft. body was built on a Hudson "8" chassis.

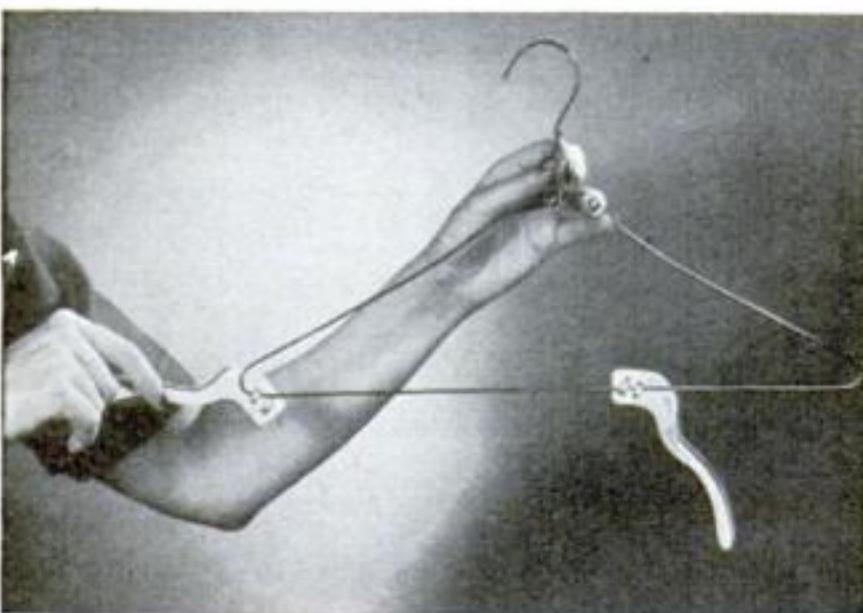


One contestant drives his 1934 Lancia, V-8, Astura.



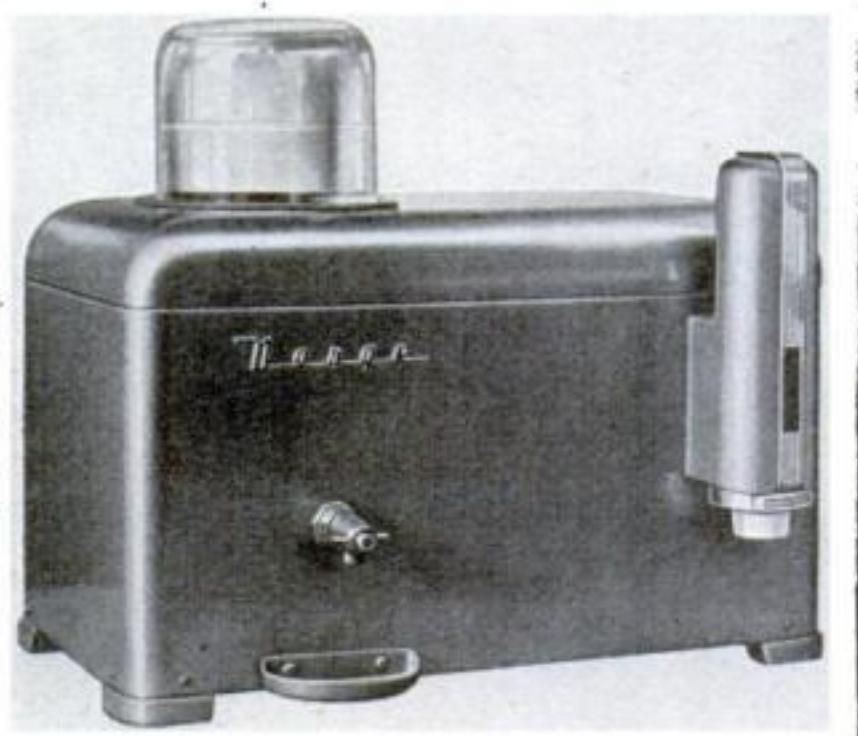
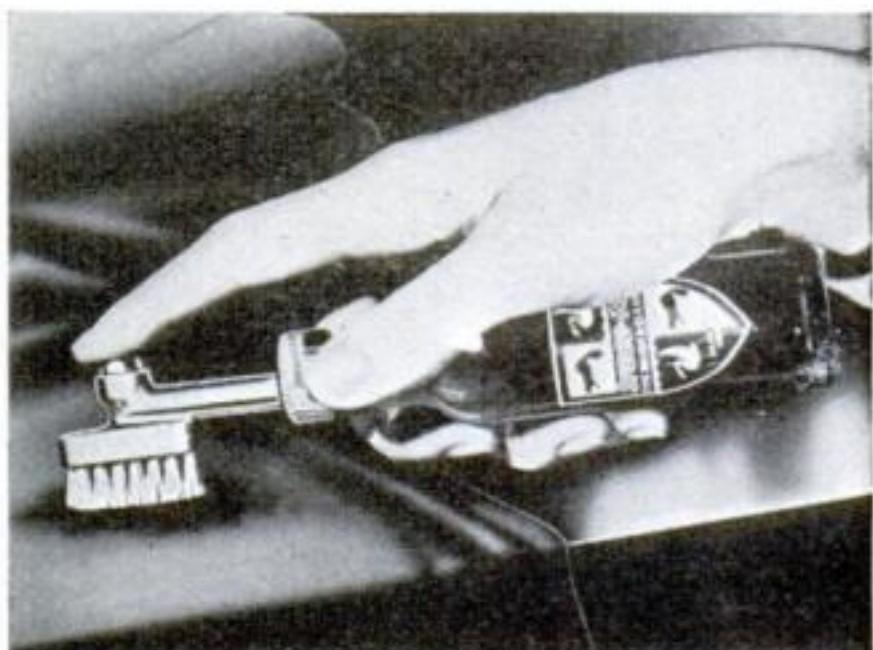
HOT FOOD can be kept right at hand throughout the meal by use of a novel glass-topped dining table included in a display of new furniture presented by R. H. Macy & Co., of New York. In the center of the table is a steam compartment for cooked foods. Thus, housewives can prepare a meal for a dinner party, place it in the compartment, and take as long as they want to welcome their guests. When it's time to eat, the hostess can serve dinner without rising.

NEW HANGERS designed to lessen the possibility that women's skirts will become wrinkled are shown in the photo below. Two curved devices hook on an ordinary wire hanger. They are easily adjusted to the width required to fit inside the top of the skirt and hold it taut so it cannot fall. The hangers are manufactured by the Canton Metal Decorating Company, of Canton, Ohio, and distributed by M. S. Glover, of Akron.

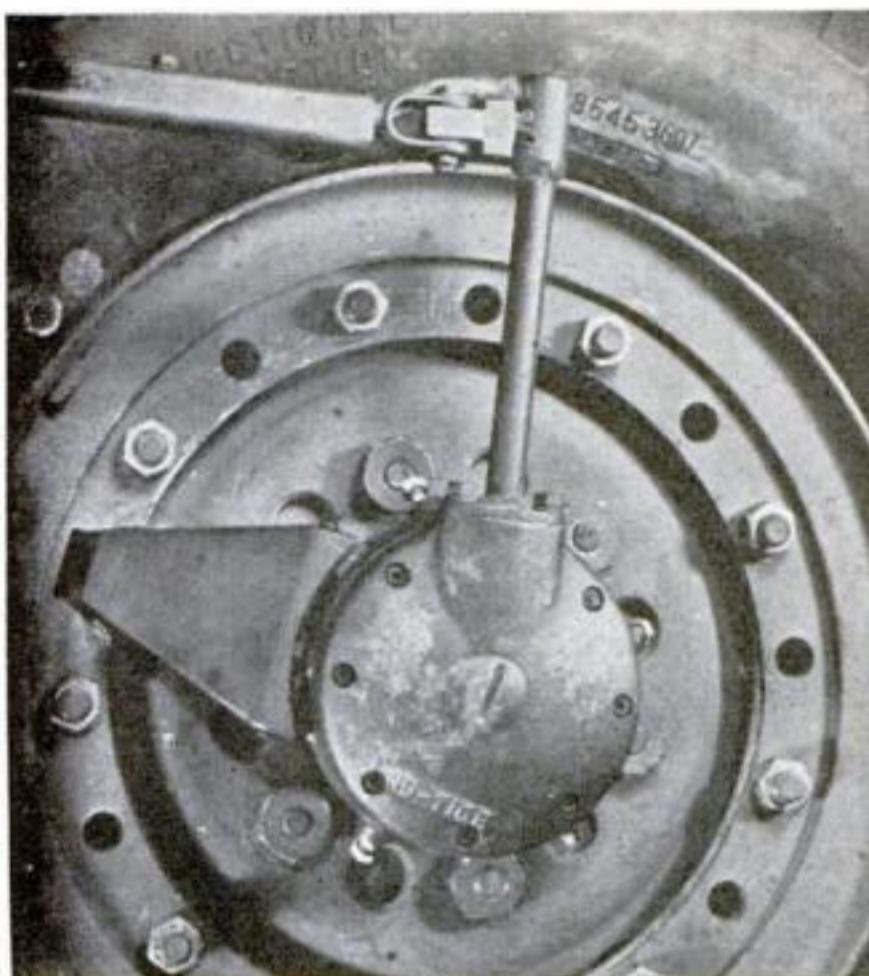
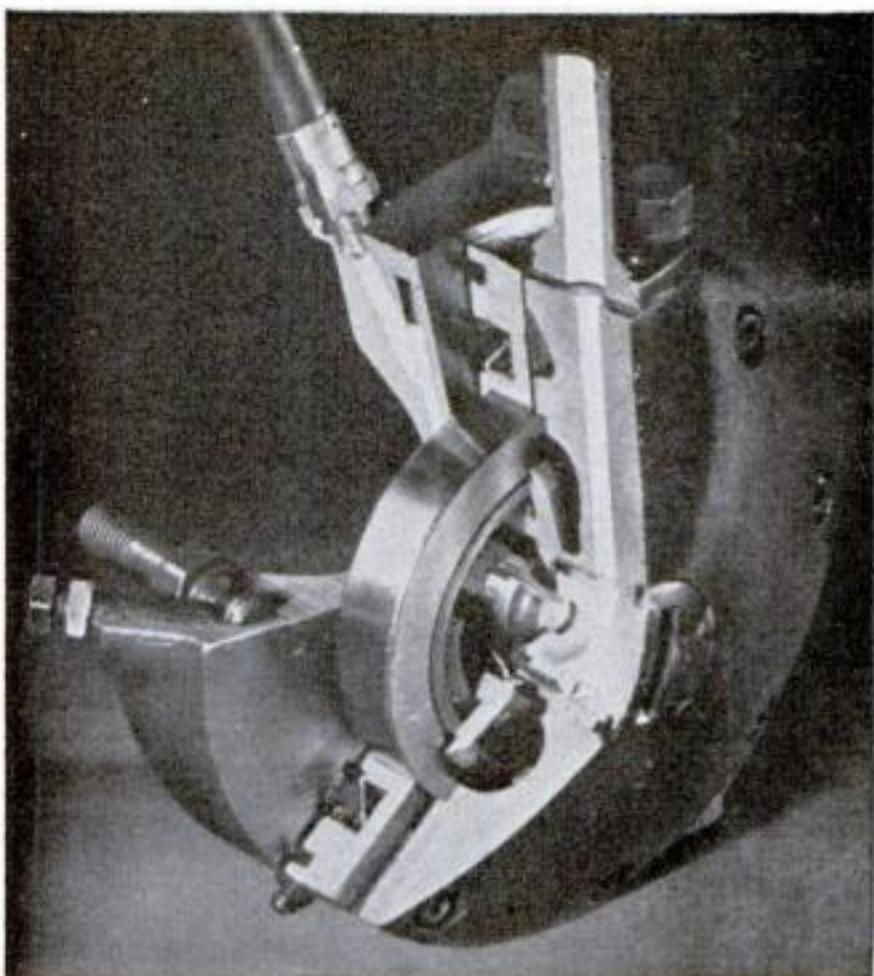


modern living

CLEANING FLUID is contained in the bottle that serves as a handle for this dry-cleaning brush produced by the Rivet-O Manufacturing Company, of Orange, Mass. When spots or stains are being removed from clothing, gentle pressure on a fingertip control button allows a small amount of fluid to flow through the brush and reach the clothing. The bottle can be refilled.



EASILY CARRIED from room to room, this small and compact water cooler may prove useful in private homes, although it is intended for use also in offices, hospitals, hotels, clubs, and elsewhere. Manufactured by the Norge division of the Borg-Warner Corp., Detroit, Mich., the cooler is powered by a 1/12-hp. hermetically sealed electric unit. The cooler is approximately 12" by 13" by 22", and it has a capacity of 1½ gallons of water. A cup dispenser is attached to the front of the cabinet.



Tires are inflated on the run through this hub joint. The inner part rotates, but the outer doesn't turn.

PUMPING UP A MOVING TIRE

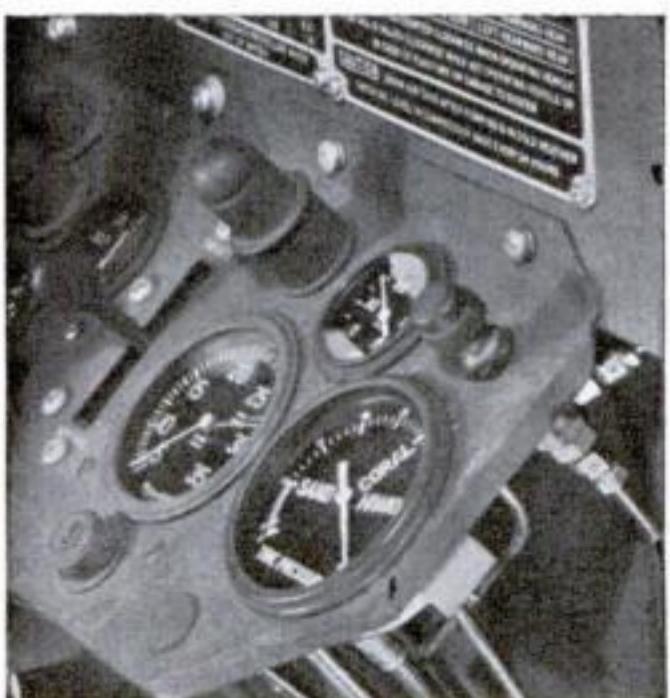
Dashboard Control on Duck Changes Pressure to Suit Terrain

Maintaining proper tire pressures may be possible on civilian cars and trucks without stopping the vehicle if Army experience is any criterion. Ducks—those General Motors trucks at home both on land and water—had central tire control for the last two years of the war. Simply by manipulating valves from his seat, the driver could increase or lower tire pressure at will. Thus, the duck could hit a sandy beach with 12-lb. pressure in its tires for maximum flotation and traction, and once beyond soft terrain could have the pressure increased to 40 lb. without ever slowing down.

Air is admitted or released through a rotating pressure joint attached to the hub,

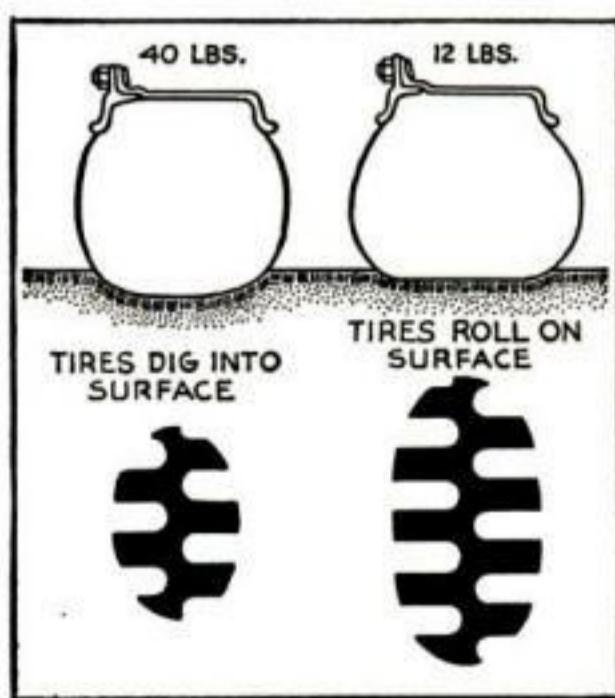
the inner, rotating member of which is shown at the left of the cutaway above and the outer, stationary member at the right. The air line from the dashboard control enters the stationary section, and a hose in the rotating member makes contact with it through a finely adjusted steel nose and plastic disk.

Each wheel is equipped with such a rotating joint sealed against sand and salt water by synthetic rubber under pressure of a large spring. Individual units can be controlled by separate valves or all by a single lever (left below) on the dashboard. A gauge gives tire pressure at a glance, and a plate above it lists correct operating pressures for various types of terrain.



Operating the lever on the extreme left of the part of the dash shown automatically changes pressure. The gauge is marked for sand, coral, and highway pressures.

Desert-type 11.00 by 18 tires on the Army duck have few plies and flex easily to increase the contact area and give better traction on sand when pressure is low.



GUS PLAYS SECOND FIDDLE

GUS WILSON was hard at work on the second morning of the winter's first real cold spell when Doc Marvin came into the Model Garage shop with a worried frown on his normally cheerful face.

"Hello, Doc," Gus greeted him. "Back from the State medical meeting, I see. Have a good time?"

"Yes and no," Doc told him. "Mostly no. I had trouble with my car, and although I handed quite a chunk of coin over to those hijacking garage men up there trying to get it fixed, it's as bad now as it was before they went to work on it. Take a look at it as quickly as you can, will you, Gus? I've got several cases scattered all over the county to attend to this afternoon, and to save my own life I can't get over 30 miles an hour out of the old bus."

"O.K., Doc," Gus agreed. He waved a hand toward the cars crowding the shop floor to capacity. "You can see for yourself what I'm up against today—but I guess no one needs a car as badly as a doctor does, so I'll slip your job into the No. 1 spot. It isn't often *you* have car trouble you can't take care of if you have to. What's the matter with your car, anyway?"

"From some of the symptoms it's displaying," Doc said, "I'd guess that it's this cold weather. But from some of the other symptoms, I'd say I don't know what it is. One of the ways I keep my patients and myself out of most serious trouble is by calling in a specialist for consultation whenever symptoms don't add up to make sense to me. This time you're the specialist."

Gus grinned. "Then go ahead with the consultation," he advised. "I'm listening."

"They've been having even colder weather upstate," Doc told him. "Night before last it got down close to zero. That didn't bother me—I knew you had put plenty of anti-freeze in my radiator and, anyhow, I had my car safe in the hotel's heated garage."

"The bus was all right until I parked near the hall where the meetings were held. When I came out, it was all wrong—the engine acted as if it was starved for fuel. It was sluggish, had no power, and I couldn't get up over 30 in high gear, no matter what I did."

"I figured that probably moisture in the fuel bowl had frozen and was choking the carburetor—remember how you had to tow me home one bitter-cold night a few winters ago because of that? So at the first garage I came to, I stopped and asked the mechanic to check my fuel bowl. He did. There wasn't any ice in it. Then he checked the entire fuel line—even the fuel tank. Still no ice."

"About then the boss came over. He scratched his head for a while, and then came up with the opinion that the cold had hardened the lubricant around the spark-advance governor in the distributor so it wouldn't work properly. That sounded plausible—until a check showed that the lubricant hadn't hardened appreciably and that the governor was working normally."

"That made the boss scratch his head some more, and he went into a huddle with the mechanic. They came out of it with another opinion—that I'd better take my trouble to a carburetor expert down the street. I did, and he said that he knew exactly what it was—that a richer mixture was needed to give the engine normal power."

Stan took the fuel pump out. "It's up to you," Gus said.



TO STAN HICKS

By
MARTIN BUNN

in such cold weather. So he put in larger jets. I paid him for the job—and before I'd driven a block the trouble had returned.

"Back in the hotel garage, I asked the foreman if he had any idea what could be causing the trouble. He said it might be the fuel pump, and he checked it while I was packing my bags and saying good-by to some of the fellows in the lobby. It was a couple of hours before I was ready to start for home. The foreman was just finishing and said everything was O.K. He was right—the car ran fine all the way home. It did this morning, too, until after I'd let it stand outside the hospital for three hours. Since then it's been acting up again."

"I'll have a look," Gus said. "Drive her in, Doc. No, never mind—the floor's too crowded. I'll check it outside." And he started for the door.

"Hold on," Doc called sternly. "You put a coat on. Think I want to have to try to keep you in bed for a week?"

Gus meekly did as ordered.

"There's no doubt about the engine not getting enough fuel," Gus said after he had

listened to it for a minute. "The job is to find out why it isn't getting enough."

He got out, raised the hood, removed the cover of the float chamber of the carburetor, saw that the chamber was only half full, and then checked the fuel pump.

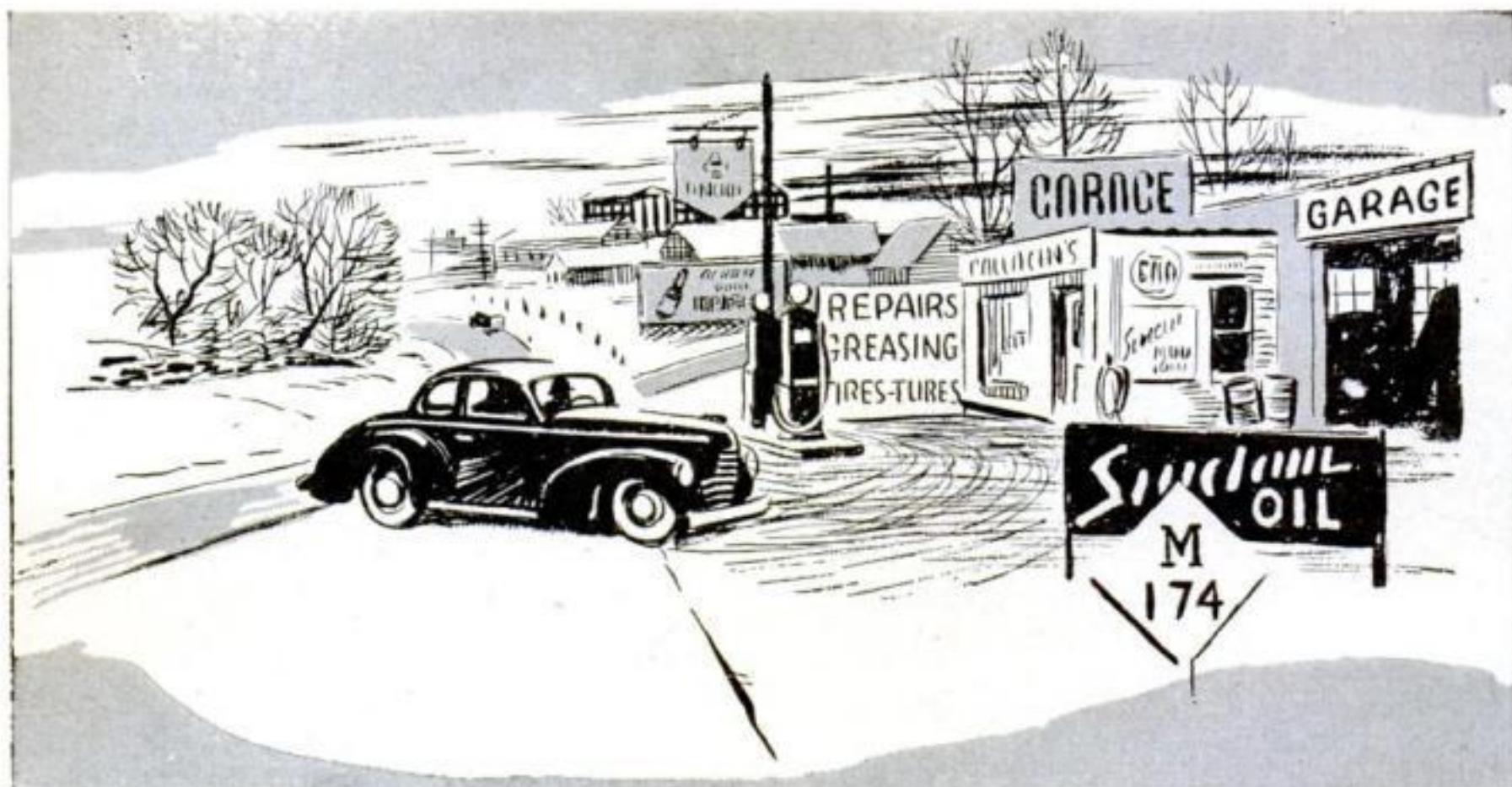
"It looks as if your friend at the hotel garage had been on the right track, but he doesn't seem to have followed it far enough," Gus said. "There's something wrong with the fuel pump, all right. Its pressure is just about half what it should be. Stan!" he called, and Stan Hicks, the Model Garage grease monkey and budding young mechanic, came out into the cold air.

"Here's a simple little problem in applied automotive mechanics for you to solve," Gus told him. As directed, Stan took the fuel pump out. "It's up to you," Gus said.

Doc went off in a taxi, and Gus and Stan went back into the shop, taking the fuel pump with them. Stan put it on the bench, but had to take out the wrecker to haul in a frozen car before he could get to work on the pump.

An hour or so later, he took the pump





"At the first garage I came to," Doc recalled, "I stopped and asked the mechanic to check the fuel bowl."

apart, examined and cleaned each part, put it together again, and tested it on the bench.

"Hey, boss," he called. "I've fixed it. The pressure is all right now."

"Good," Gus said, coming over to the bench. "What was the matter?"

Stan looked blank. "I never thought of that. There wasn't anything wrong, I guess. Each part looked O.K. as I was cleaning it. There was one funny thing, though," he recalled. "The diaphragm was wet."

"Wet, was it?" Gus was thoughtful. Then he grinned. "Did you dry it off?"

"Oh, yes," Stan assured him. "But what goes on here, boss? Why was the pump bad when you checked it and all right after all I did was to take it apart and put it together again? It doesn't make sense."

"Yes, it does—if you throw in the fact that you took the wrecker out between the time you brought the pump in from Doc's car and the time you took it apart," Gus told him. "Results are what they pay off on, kid, and you got 'em—no matter how. It could be that you're a genius without knowing it." He gave Stan a friendly shove. "Put Doc's pump back in, and then apply your talents to one of these other jobs."

Doc Marvin hustled into the shop on the stroke of two. "I'm in a rush!" he called from the doorway. "Emergency call. Did you get the pump fixed, Gus?"

"Stan did," Gus told him. "He's good, Doc. In just an hour he'd diagnosed and cured a car ailment that is one of the toughest of any to spot. I just played second fiddle. But I'll tell you about it when you have more time. Your bus is outside, ready to roll."

"Good for you, Stan," Doc said hurriedly.

He sped away to answer the emergency call.

Stan scowled at his employer. "I don't mind being kidded when we're alone," he said, "but I don't think it's right in front of the customers."

"That wasn't kidding, Stan," Gus smiled. "Far from it. You did a real job. Of course, you don't know how you did it, but that happens to the best mechanics, and I'm not going to tell Doc that part of the story. What I was doing was building you up with the customer."

"Maybe I need building up with some of our customers," Stan grinned. "What was the matter with the pump, anyway?"

"You really should know," Gus said. "Remember that you went out with the wrecker after you'd brought the pump into the shop and didn't disassemble the pump until you got back about an hour later? That hour's wait in the warm shop was the cure, along with your wiping the wet diaphragm dry."

"If you had started on the pump as soon as you had it in the shop, you would have found ice on the diaphragm—enough to restrict its action. It's lucky the ice didn't puncture it—that can happen."

"Accumulated condensation inside the fuel pump was the underlying cause of the trouble, and when this cold weather came, the condensation froze. Of course, after the car had stood in a heated garage for a while, the ice melted, and the pump checked all right—the way it did in Doc's hotel garage—and there was nothing to show what had been causing the trouble."

"If you hadn't been smart enough to notice that the diaphragm was wet, we'd probably be trouble-shooting the job yet. Nice work, Stan—and I'm not kidding."

AUTO IDEAS

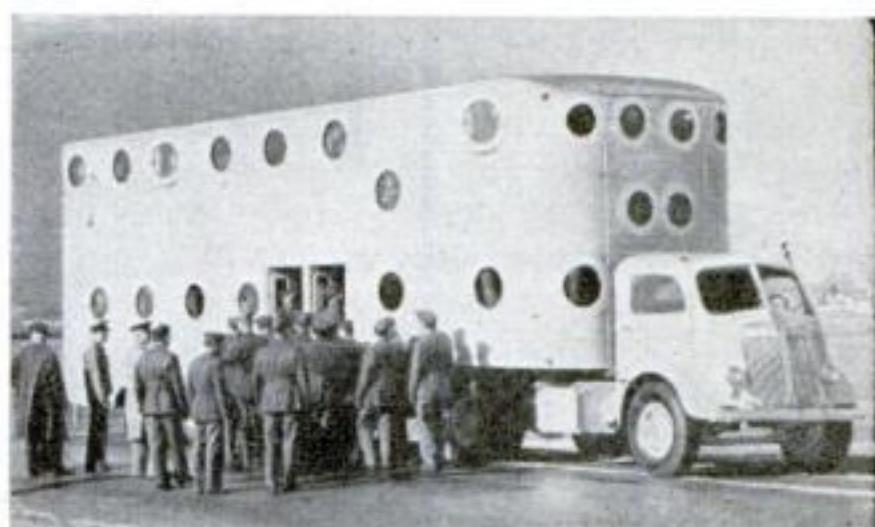


SNOW WEASELS, originally designed for Army use in Alaska, give promise of many civilian uses, particularly in mountainous regions. The U. S. Forest Service already is employing two for routine travel in the high Rockies. Other foreseeable uses include rescue of stalled motorists, carrying help to snowbound ranchers, and hauling feed to starving livestock in isolated grazing areas. Loaded to its capacity of 1,260 lb., this two-

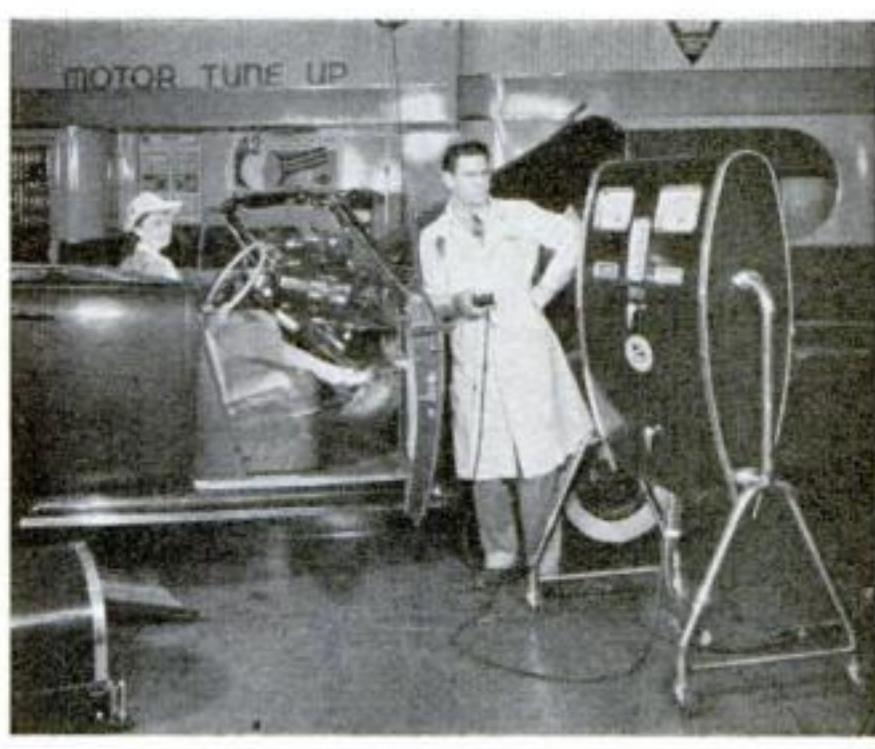


passenger cargo carrier sinks only 18" in light snow, and even under the worst conditions it beats struggling along afoot on skis or snowshoes. Capable of speeds up to 25 m.p.h., it overcomes most difficulties of terrain, ambling up a 45-deg. grade and over vertical obstructions as high as 19". Although designed for snow travel, it fords rivers less than 44" in depth on its own power and in deeper water becomes a boat.

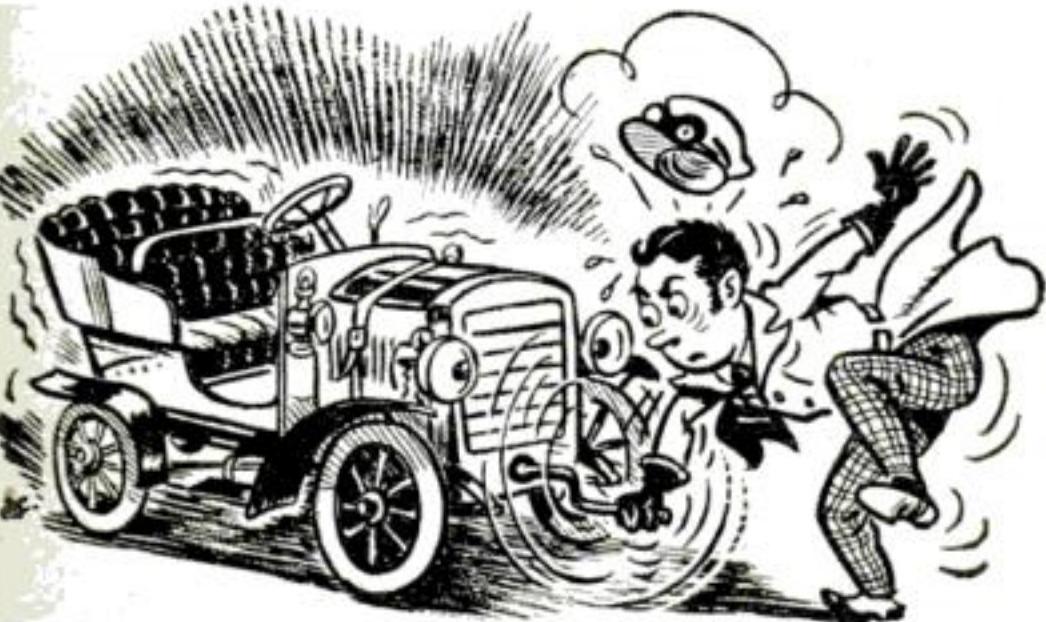
A GIANT BUS capable of carrying 250 persons, 100 seated and the rest standing, was built during the war by the White Motor Company for troop transportation in the wide expanses of an Army camp. With port-hole-type windows for both the lower and upper decks, the big transport looks like some fantastic land battleship. Although the vehicle is 15' high, the height is not particularly noticeable because the body is 2' wider than usual. The huge body was constructed on a rebuilt transport chassis.



CHECKING A CAR for defects in the power plant can be accomplished in five to eight minutes with the "Moto-Mirror," a dynamometer produced by the Clayton Manufacturing Company, of Alhambra, Calif., for service-station use. It consists of two major units, a cabinet containing recording instruments and a frame on which the rear wheels of the car are placed to operate transverse rollers. The frame embraces a hydraulic power-absorption unit fitted with solenoid remote-control valves, an electric induction tachometer, and a torque recorder. Simulating road conditions and testing the car throughout its driving range, the dynamometer indicates what adjustments are needed to bring the vehicle to top performance.



DON'T LET YOUR



Cranking a Horseless Carriage Was Quite a Task, but Modern Starters Seldom Let Us Down.

By WILLIAM H. CROUSE

IT WAS the year 1910. Henry M. Leland, head of the Cadillac company, was listening with interest as a young engineer talked about a better method of starting automobile engines. Some of the best engineering brains of that day already had wrestled with the problem, for hand cranking was at best uncertain and often dangerous.

What the young engineer proposed was revolutionary. He wanted to use an electric motor to do the cranking. He knew electrical experts claimed that an electric motor powerful enough to crank an automobile engine would be far too large and bulky, but he shrugged these calculations aside. After all, small electric motors could be overloaded for brief periods without damage to their windings.

The young engineer was C. F. Kettering, later vice president of General Motors and the famous head of its research laboratories. With Leland's backing, he developed an electric cranking motor, and by 1912 it was standard equipment on the Cadillac. Today, an automobile without an electric cranking motor would be an oddity indeed. Before and since 1910, however, many other ideas were tried—the priming-pump starter, acetylene-gas starter, compressed-air starter, and mechanical spring-wound starter, to name only part of the list. But all of these were found wanting.

Mounted on the flywheel housing, the modern starter uses a drive pinion that meshes with the ring gear on the flywheel.

When a switch is closed, the battery spins the armature, and the drive pinion rotates the flywheel, starting the engine.

Since the gear ratio between the drive pinion and the flywheel is often as high as 15 to 1, the engine, after it starts, would spin the pinion and armature at ruinous speed unless provision were made for demeshing the pinion without delay. Various automatic mechanisms are used to accomplish this. Two of the most common are the Bendix drive and the overrunning clutch.

A Bendix drive consists of two major parts, an externally threaded hollow sleeve attached to the armature shaft through a spiral spring, and a drive pinion with internal threads that match the sleeve threads, much as the internal threads on a nut match the external ones on a bolt.

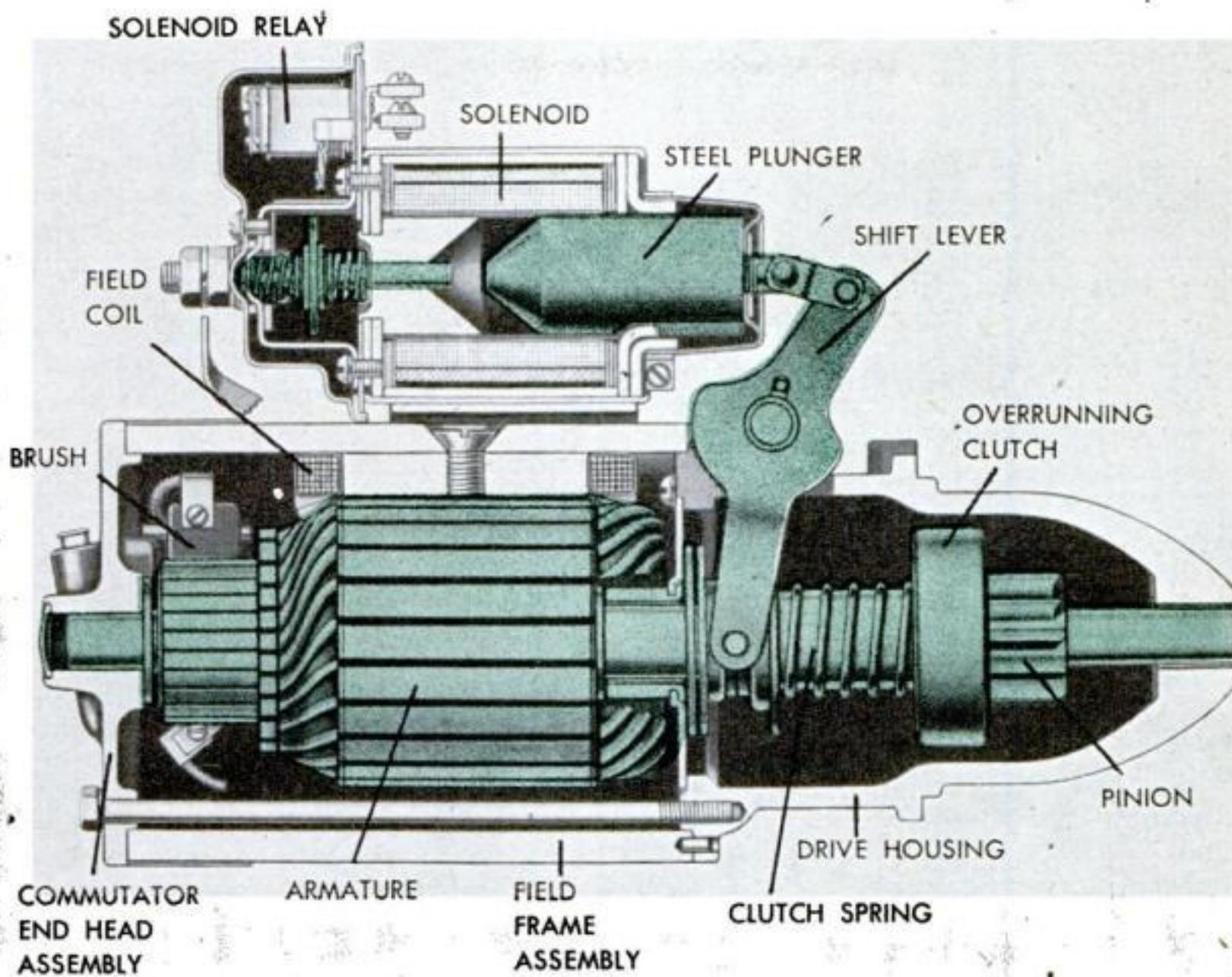
When the switch is closed, the armature and sleeve begin to rotate. Inertia, however, prevents the drive pinion from instantly picking up speed with the armature. As a result, the threaded sleeve turns within the pinion, forcing the pinion to move axially along the sleeve and into mesh with the ring gear, just as rotating a bolt in a stationary nut would force the nut to move axially on the bolt. The heavy spring, through which the cranking effort is carried from the armature to the sleeve and pinion, compresses slightly to take up the shock of meshing. When the pinion reaches the end of its travel, it is compelled to rotate as fast as the sleeve and armature. Consequently, the flywheel is turned and the engine cranked.

What happens when the engine picks up speed and spins the drive pinion faster than the armature and sleeve can be visualized by thinking again of the action of a nut

Hand-operated priming pumps were an early form of self-starter, but they were not much of a success.



STARTER STOP YOU



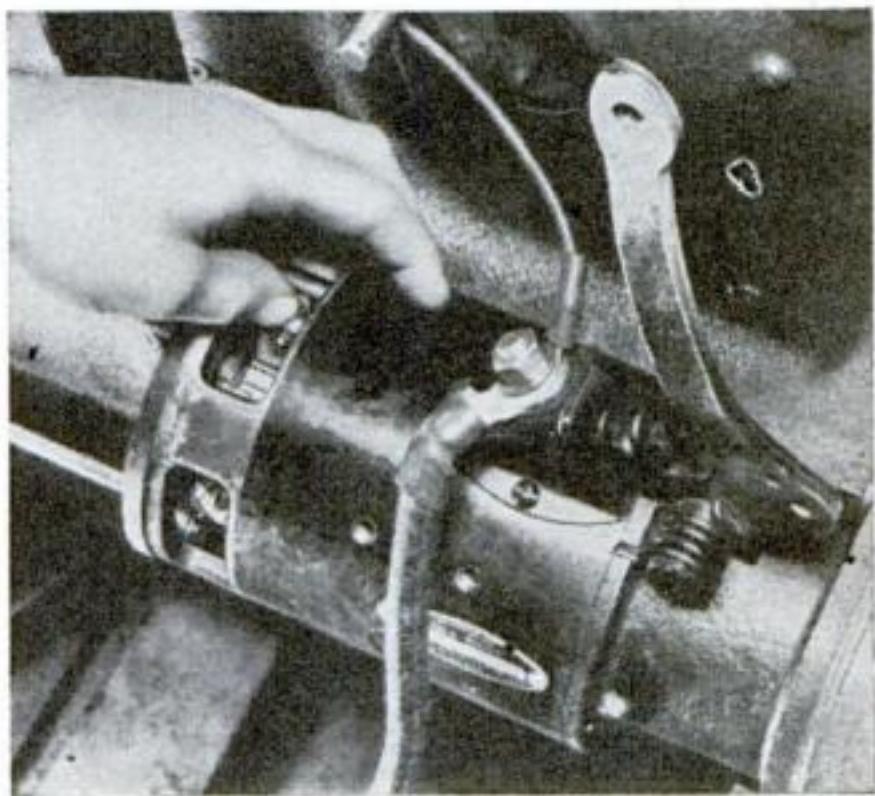
In this cranking motor, a solenoid operates the shift lever that moves the overrunning clutch into mesh.

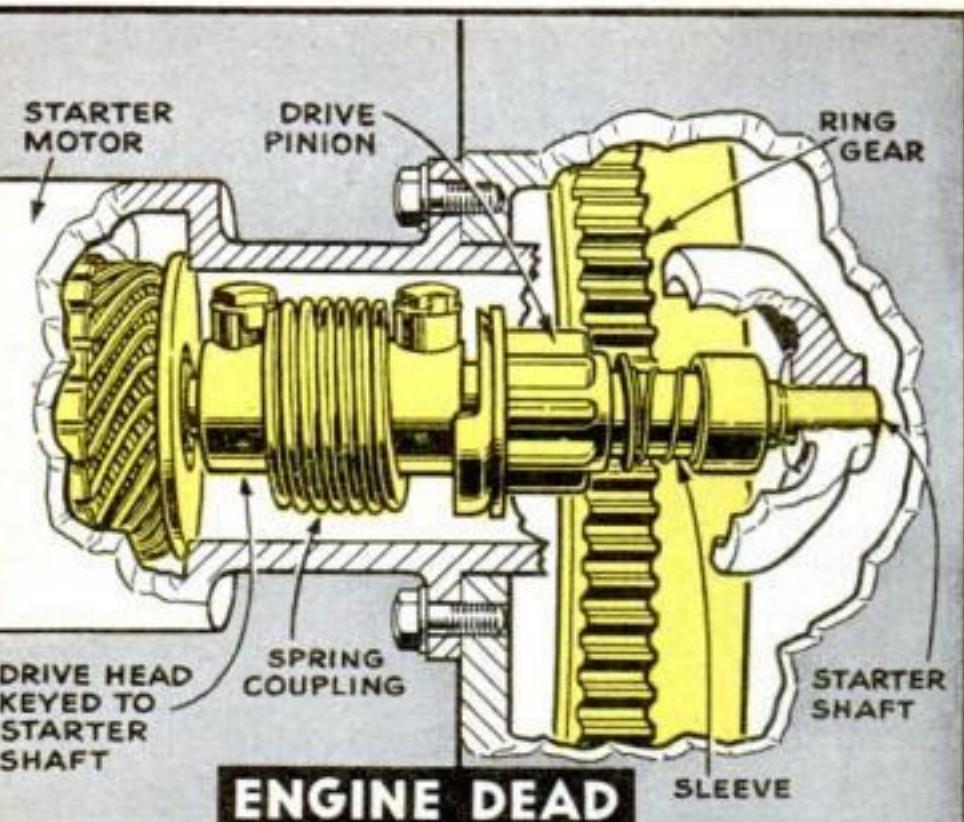
and bolt, the nut and bolt in this case both turning in the same direction but the nut much faster than the bolt. Since we have seen in the preceding paragraph that the nut moves axially in a certain direction when the bolt is turning faster than the nut, the nut must now move axially in the opposite direction. This is exactly what happens when the drive pinion begins to turn faster than the sleeve. The threads automatically throw it out of mesh with the flywheel. An antidrift spring keeps the pinion, when at rest, from slipping into mesh while the engine is running.

Although the principle is the same, not all Bendix drives are alike. Two general classifications are produced—the inboard type, in which the pinion must move toward the armature to mesh with the ring gear, and the outboard type, in which the movement is in the opposite direction.

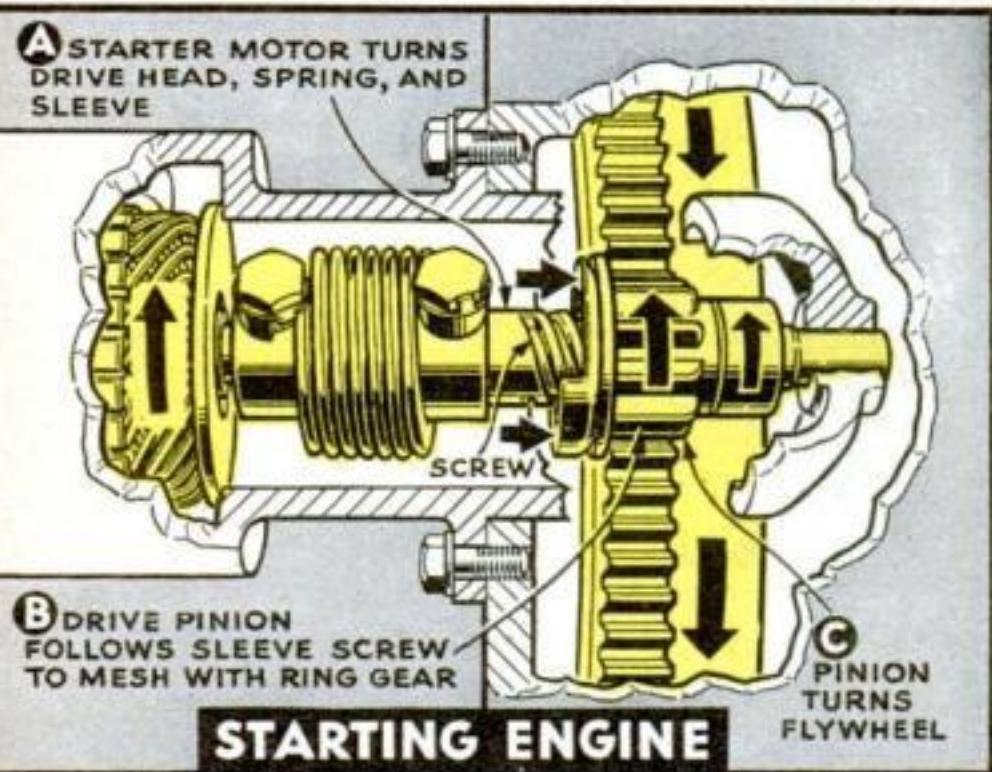
When a cranking motor fails to function properly, removal of the cover band will permit inspection of the brushes and commutator, as indicated here.

Instead of withdrawing the drive pinion from mesh as the engine starts, the overrunning clutch drive permits the pinion to overrun, or run faster, than the armature. When the engine is to be started, external straight splines on the armature shaft and

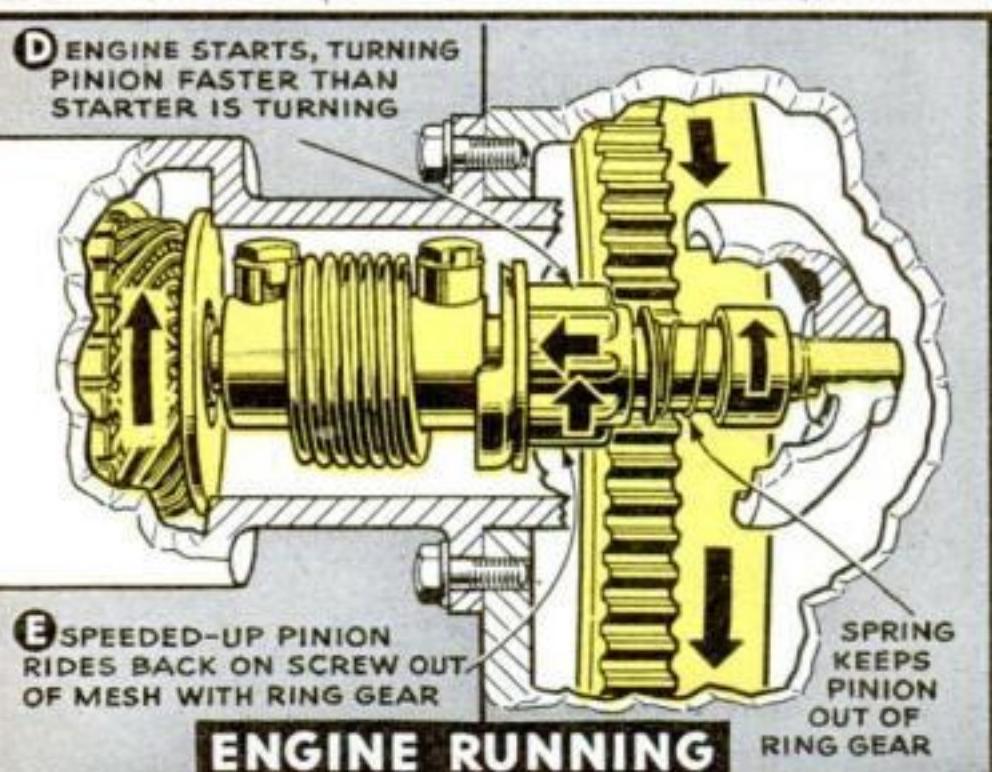




ENGINE DEAD

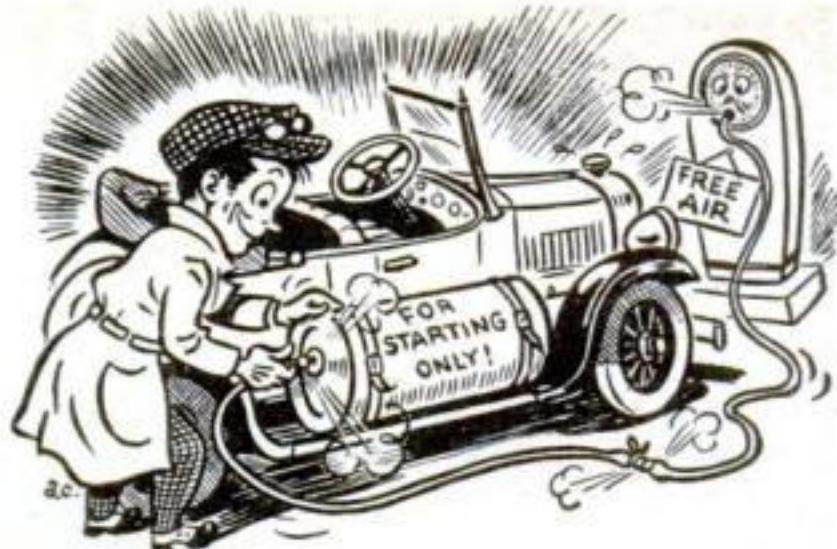


STARTING ENGINE



ENGINE RUNNING

Matching threads on the sleeve and in the drive pinion give a Bendix drive an action similar to that of a nut and bolt. As the motor whirls the sleeve, inertia keeps the pinion from coming up to speed at once, so the screw action moves the pinion sideways—into mesh. When the engine starts, the pinion turns faster than the sleeve, so screw action moves the pinion out of mesh.



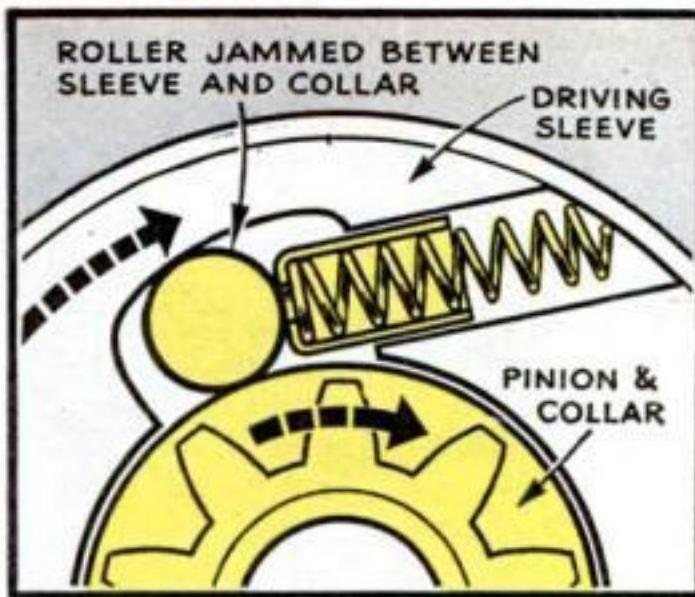
Some drivers in the olden days had to wrestle with self-starters operated by compressed air.

matching internal splines in the pinion allow a shift lever to force this gear axially along the shaft and into mesh with the ring gear. The lever is operated either by linkage from a foot pedal or by a solenoid on the cranking motor.

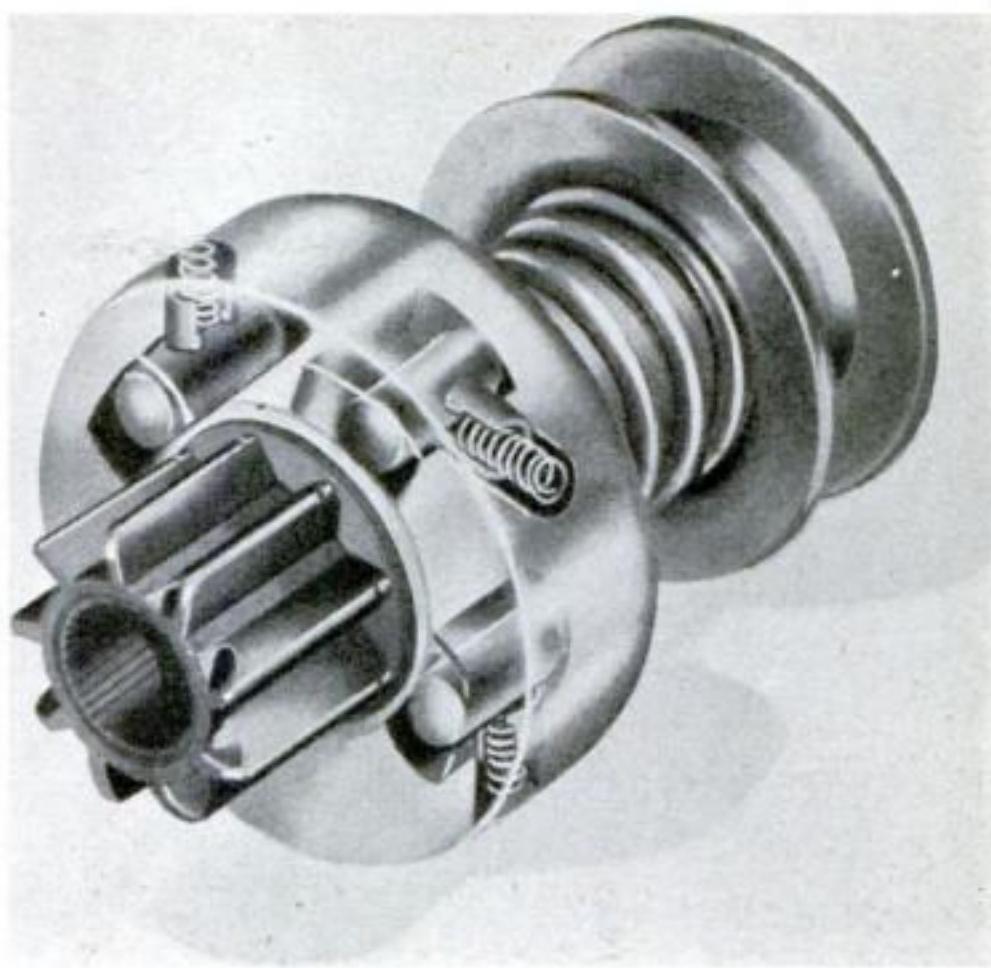
As the lever completes its travel, it closes a switch and cranking takes place. If the pinion and ring-gear teeth should butt instead of meshing, a spiral spring between the shift-lever collar and the clutch compresses, then snaps the pinion into mesh when the armature rotates. When the lever is released after the engine starts, a spring returns it to the idle position and also pulls the pinion out of mesh.

An overrunning clutch consists of an outer shell, with four notches into which four steel rollers are fitted, and the pinion and collar assembly. The notches are shallower at one end. When the armature and outer shell begin to rotate, the four rollers jam in the smaller end of the notches, forcing the pinion and collar assembly to rotate. As the engine starts, it drives the pinion faster than the armature is rotating. The rollers move into the larger end of the notches, where they cannot jam, and the pinion and collar assembly overrun, or rotate faster than, the outer shell and armature.

On many cars, starting is accomplished with a foot pedal or switch, but others have systems that start the engine automatically when the ignition switch is turned on and the accelerator pedal is depressed. Such systems use a magnetic switch or solenoid mounted on the cranking motor, plus a vacuum switch linked with the accelerator pedal. Thus, depressing the accelerator pedal for starting closes an electrical contact in the vacuum switch and, if the ignition switch is on, a circuit is completed between the battery and solenoid. The solenoid then



When the engine starts, an overrunning clutch permits the drive pinion to run faster than the armature. Four rollers operating in notches in the outer shell produce this action. When the armature turns, the rollers jam into the shallow ends of the notches, forcing the pinion and collar to crank the engine. As the engine starts, the rollers automatically move to the end where they cannot jam.



closes the starter circuit—and cranking takes place. When the engine starts, a vacuum develops in the intake manifold. This actuates the vacuum switch, the solenoid is disconnected from the battery, and the cranking motor stops.

Now that we have had a general look at the operation of the cranking motor, we come to the question of what we can do about it when the engine refuses to start. Starting complaints can be divided into three general groupings: the engine cranks normally but does not start, engine cranks slowly but does not start, and engine does not crank at all.

When the engine is spun at normal cranking speed but does not start, the trouble undoubtedly lies elsewhere than in the starter.

At low temperatures, slower cranking is to be expected, for the engine lubricating oil is much heavier, the engine is stiffer, and the battery is somewhat less efficient. If, considering the temperature, the cranking speed is excessively low, check the battery with a hydrometer. If the battery is in good condition, the cables and connections should be examined for broken or frayed strands that might not allow sufficient current to flow. If these seem in good order, remove the cover band from the cranking motor and observe whether the brushes and commutator are worn or dirty.

If there is no response at all when the cranking motor switch is closed, the headlights may give a clue to the trouble. If they do not burn, or burn only dimly, the battery is probably run down. If the lights burn at more or less normal brilliance, they

will do one of three things when the cranking motor switch is closed: go out, dim considerably, or continue to burn brightly.

When the lights go out, there may be a bad connection at one of the battery terminals. In such cases, the connection sometimes may be improved sufficiently for emergency starting by swinging the cables back and forth on their terminals. If the lights dim considerably, the battery probably is in a low state of charge, but if it is not, some difficulty in the cranking motor or engine should be suspected. In the engine, such conditions as tight or stuck pistons may prevent cranking. If the lights stay bright, there probably is an open circuit in the starter wiring.

Spring-wound mechanical starters may never have done this, but the motorist never was quite sure.



HOME OWNERS



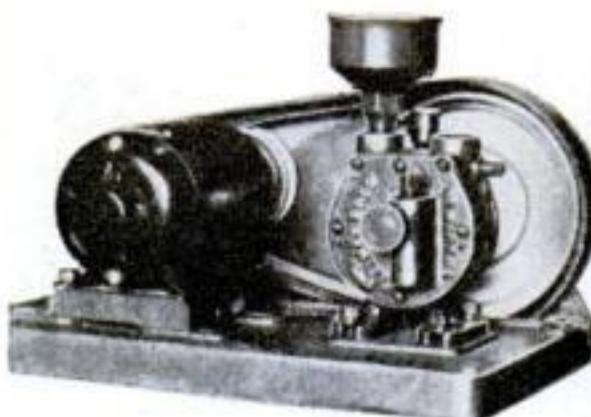
CONCRETE BALLOONS that helped to solve a war-housing shortage may have a chance to fill the same need during peacetime. These structures, erected by spraying concrete on inflated balloons and then removing

the balloons, have housed Goodyear workers at Litchfield Park, Ariz. Wallace Neff, Los Angeles architect, proposes such designs as the double connected dome at left above and the single dome at right.



NO COAL SHORTAGE HERE. When he gets ready to fire his furnace, all W. B. Swope ever has to do is to go to the back yard of his home at Welch, W. Va., and dig up a few shovelfuls of coal. He—fortunate man—has his own private 300' bituminous coal mine with an opening only 25' from his back door. Here he is shown filling a wheelbarrow with enough fuel to keep the furnace going all day. No, sorry, mines like his aren't being manufactured for general sale. But at least it is comforting on these chilly days to know that some people have no difficulty in keeping warm.

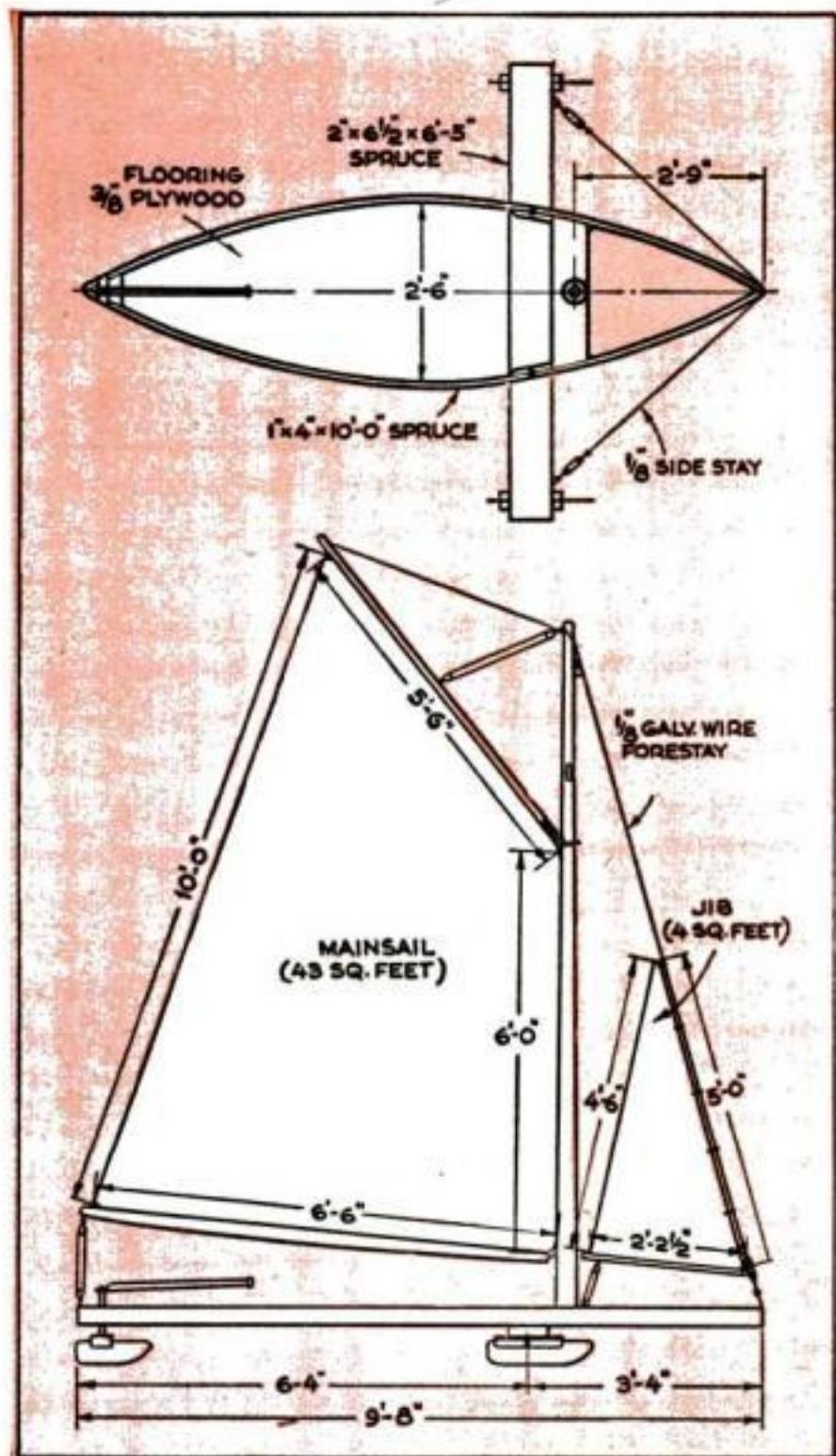
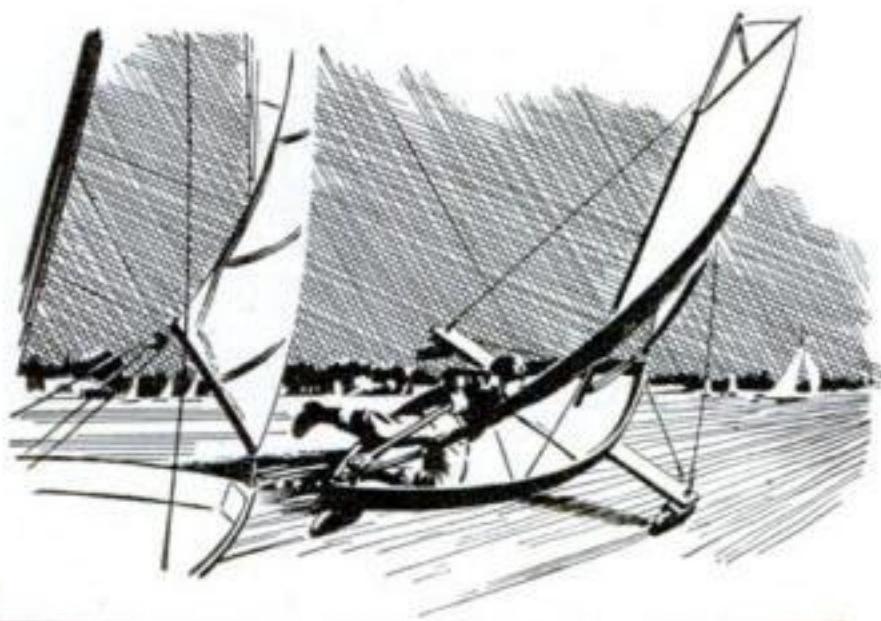
FIRE RETARDING characteristics are claimed for a new chemical product that is sprayed or brushed on like paint and is available in a variety of colors. Supplied as a powder, it is mixed with water for application on walls, ceilings, wood beams, and insulation panels, and may be used on garages, farm buildings, boats, trailers, planes, and the like. Albi Chemical Company, of Chicago, the manufacturer, says that the coating becomes a cellular mat or blanket when exposed to flame and protects the surface it covers. The Underwriters' Laboratories, Inc., reports that tests show it retards burning in red oak by 50 to 70 percent.



HEAT IN RADIATORS is assured by a vacuum-pump unit made by Leiman Bros., Inc., of Newark, N. J., that converts ordinary steam heating into a vacuum-steam system. Return pipes to the furnace boiler may be connected from all radiators, or they may be necessary from only one or two that offend regularly by collecting air pockets.

BOY'S ICEBOAT GOES LIKE THE WIND

By Richard C. Clapp



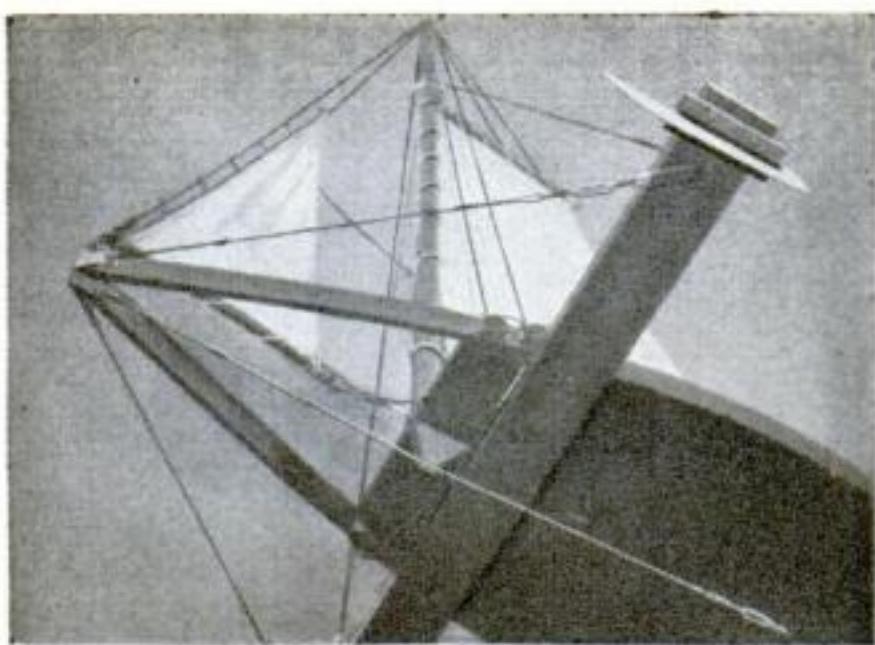
Easily handled by any red-blooded youngster, this trim little iceboat is fast—but safe. To shape the frame, temporary spreaders are used. Notice that sail dimensions are given in the side view.

ALTHOUGH he was not yet quite six, my son David sailed this little iceboat all last winter with great success. Faster than many boats with larger sails, it would delight any youngster. When we load it on the car and go to the river, there never is any lack of boys asking for a sail.

Any good craftsman, even if he is a beginner in iceboating, should have no difficulty building the boat. The necessary materials are found in most workshops or, if not, can be bought at little expense. Some substitutions may be necessary, but builders are urged to stick closely to the stated dimensions, since the boat has been tried and proven. If a secondhand sail is available, the entire job can be done for less than \$20. Even with a new sail the cost should not exceed \$35.

Before beginning the frame, form the metal bow and stern plates, as shown in the drawings, and cut the triangular stern block

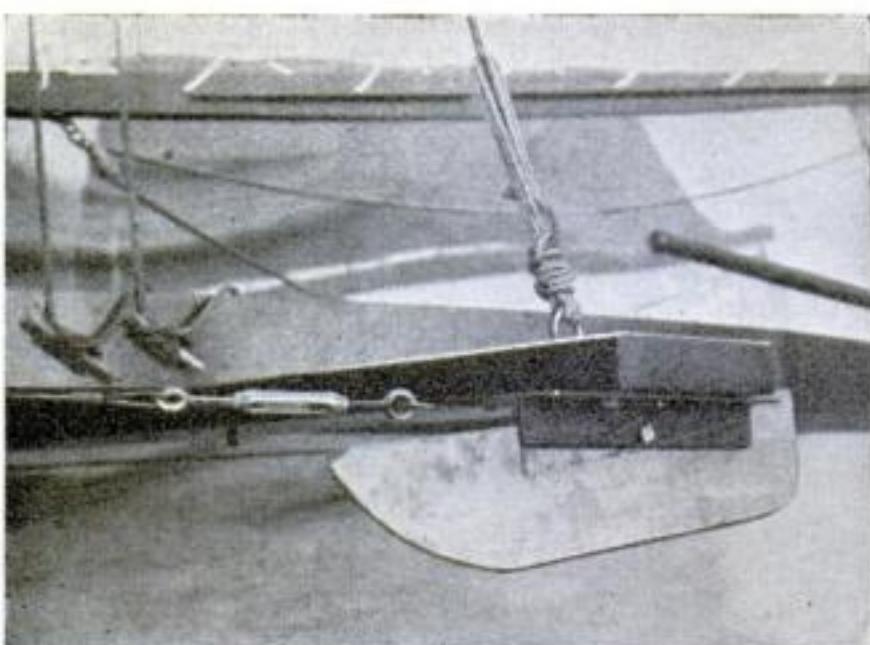




Although the plans specify an oak block, a metal bracket may be attached under the mast as above.

from a piece of oak, being careful to center the $\frac{3}{4}$ " hole for the tiller post and to drill it vertically. Then spike the two 10' sides to the block and attach the stern plate with 2" wood screws. In shaping the frame, a spreader will be required at the center and possibly one or two on each side. It may be necessary to call in a neighbor to help you draw the bow together and attach the bow plate.

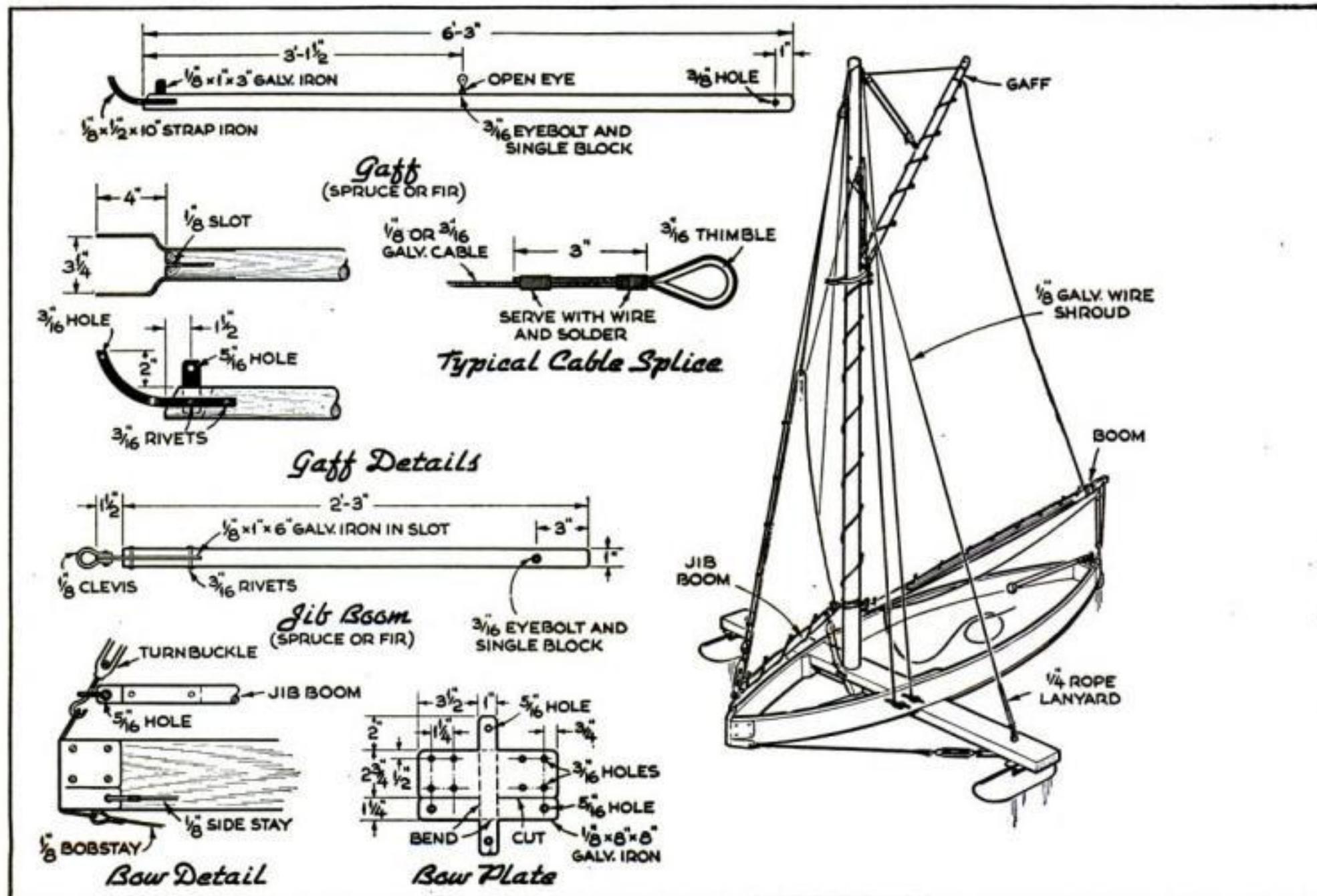
Install the flooring before removing the spreaders, fastening with $1\frac{1}{2}$ " wood screws. Although $\frac{3}{8}$ " waterproof plywood makes

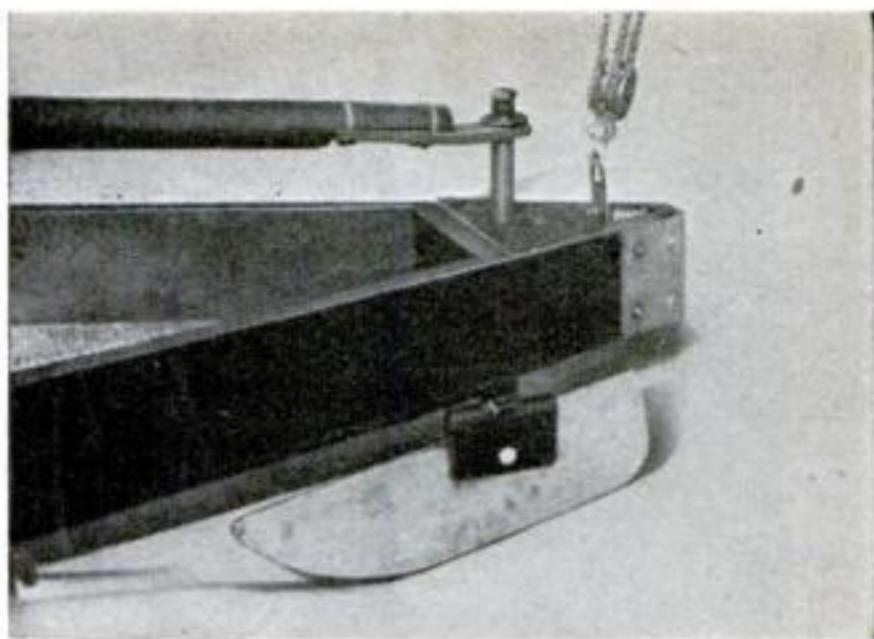
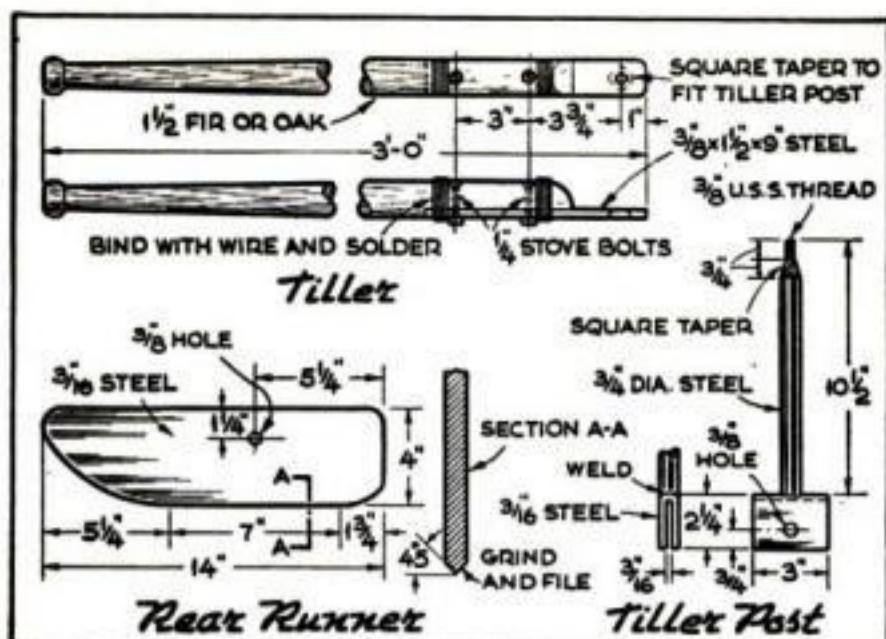


Pivoted runners give more speed. Two cleats seen on the frame hold the ropes that raise the gaff.

the best flooring, solid boards can be used.

The mast is stepped on a plank cut to length from a 2" by 6" piece of spruce. This fits in mortises in the upper edges of the two 12" spruce or pine pieces bolted to the frame. Spikes driven through the frame and into the ends help keep the step from twisting when the mast is in place. One 20-d. nail for holding the mast is driven into place before the 2" by 5" by 6" oak block is attached under the step. If you prefer, a metal brace can be used instead of this block, as on the original boat.





Since some shearing and welding are needed, it may be best to have a local shop make the metal parts.

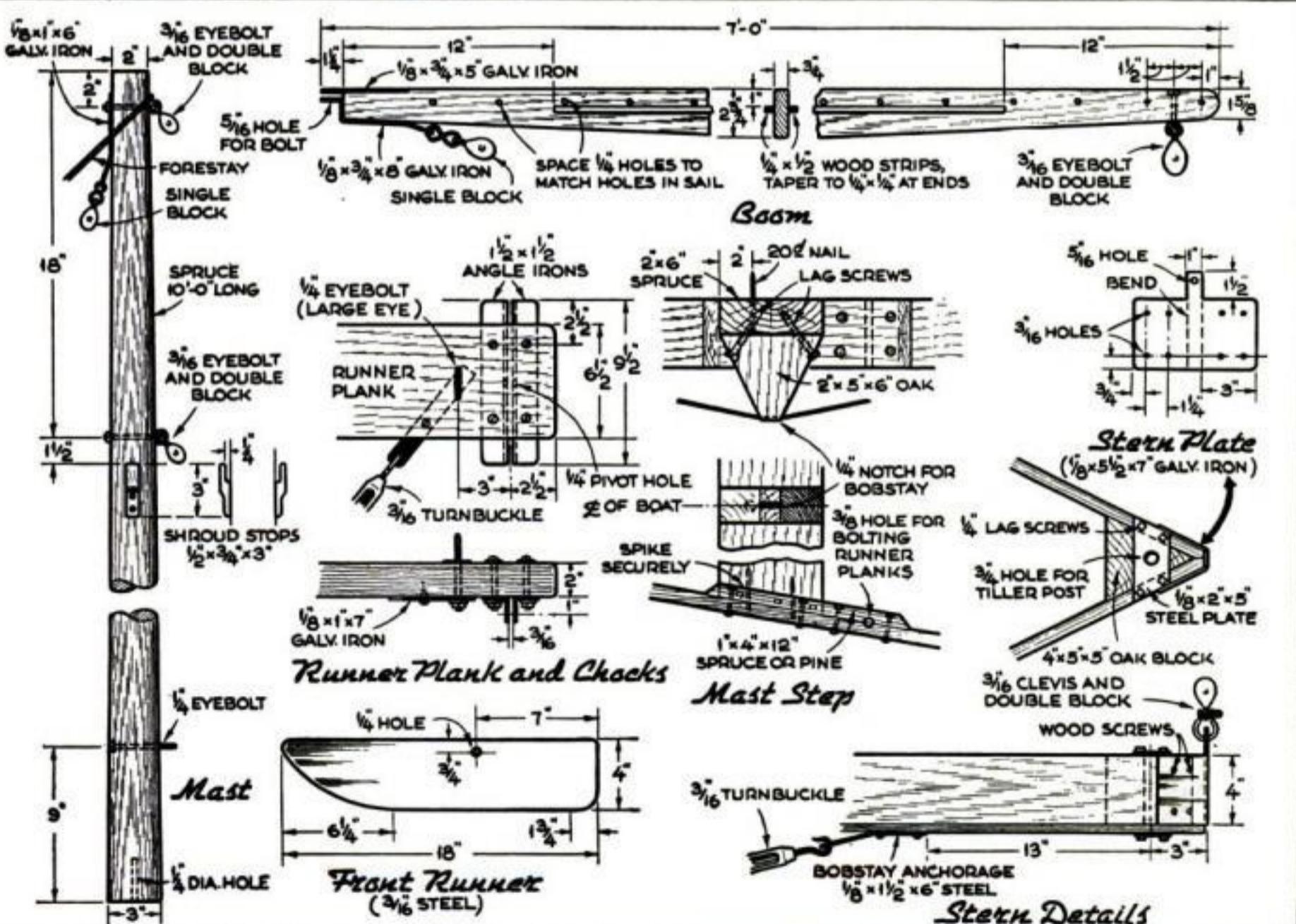
Steel plate for the runners should be obtainable at any large machine shop. If possible, have the runners sheared to approximate shape there. Then grind to final shape on a coarse-grit grinding wheel and finish with a fine mill file. Each running edge should be finished to a 45-deg. angle.

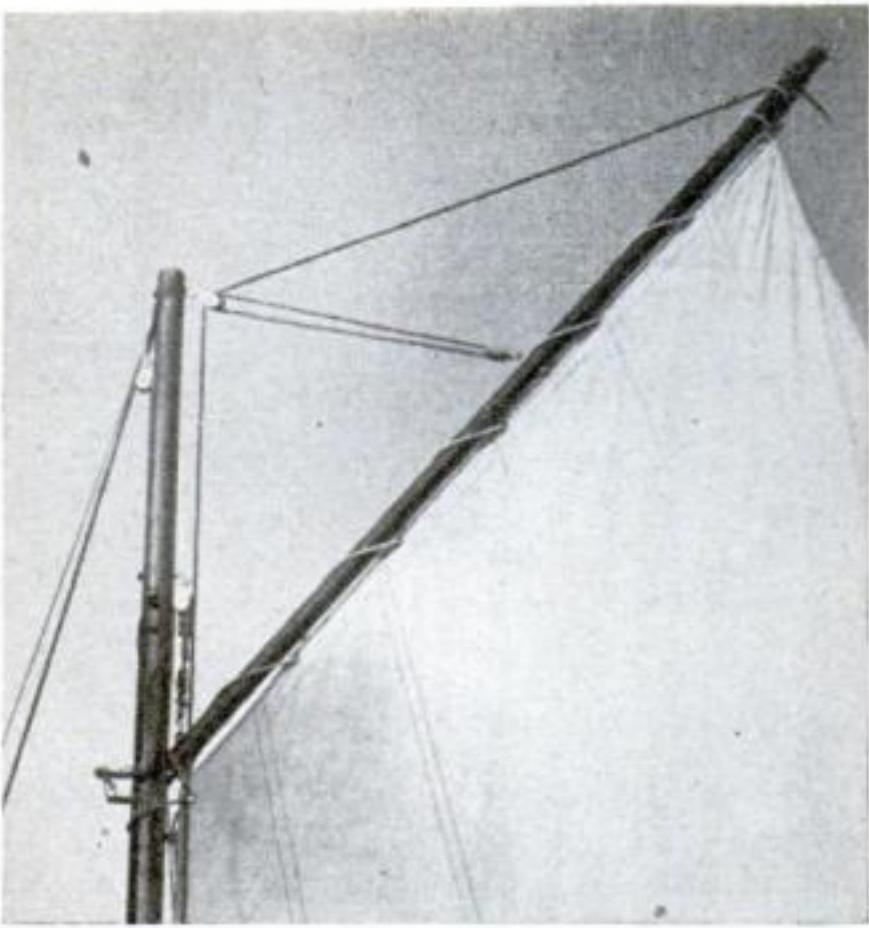
The speed of the boat will be in direct proportion to the accuracy with which the front runners are lined up. After cutting the runner plank to length, clamp on the angle-iron pieces that form the chocks, place the runners in the chocks, and square

In the original boat the sheet block was attached as shown here. The drawings give a simpler method.

all up on the plank by using a carpenter's square. Then across the cutting edge of both runners at the back lay a stick of stock about 7' long and exert pressure to cause a slight impression in the wood. Next place the stick across the runners at the front, and, if the runners are parallel, the depressions in the stick will fit over the cutting edges in that position.

Proper squaring and centering of the runner plank on the frame is another important factor in the success of your boat. Mark the centerline of the plank both as





Hitched to the peak of the gaff, the peak halyard is rigged through two blocks, then down to "deck."

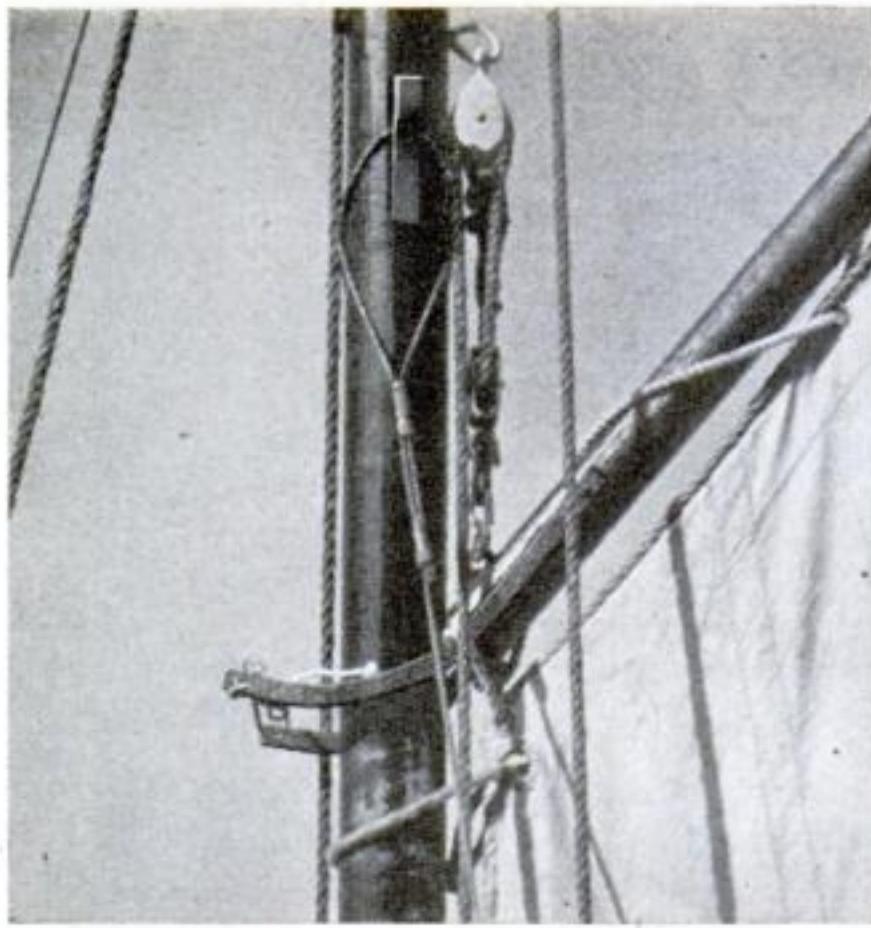
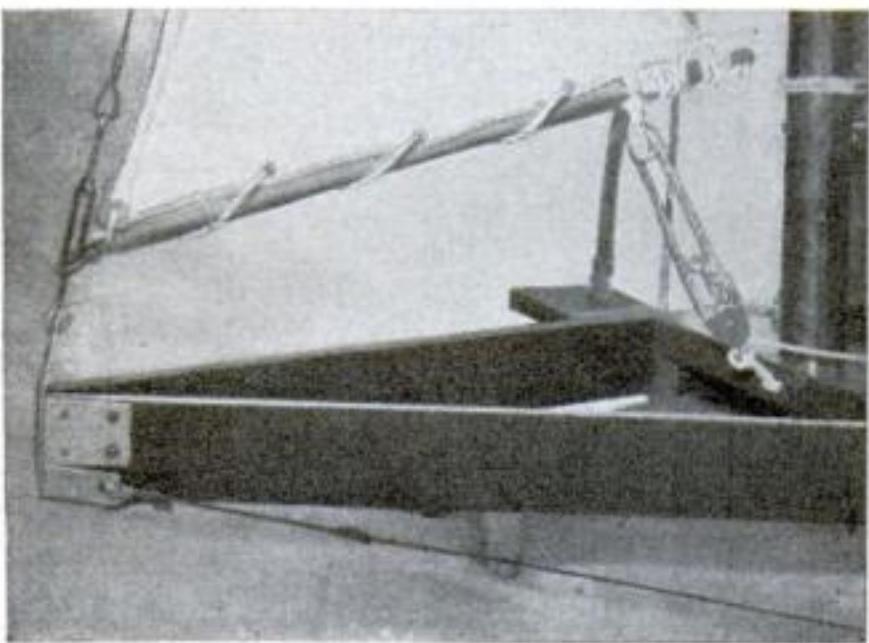
to length and width and place a small brad at the point where the two lines cross. Then center the plank on the frame by aligning this point on a cord strung from the bow to the stern. Check for squareness by measuring from the tiller-post hole to the same point on each runner chock. When you feel certain everything is square, drill $\frac{3}{8}$ " holes through the plank and frame and fasten with $\frac{3}{8}$ " carriage bolts.

Like the front pair, the rear runner should have a slight rocker effect for smooth operation of the boat.

You will need 50' of $\frac{1}{8}$ " or 3/16" stranded galvanized wire for the shrouds and stays. If stranded wire is not available, $\frac{1}{8}$ " solid wire will do, although it doesn't give as finished a job. In attaching the bobstay, note that the rear anchorage is centered under the flooring.

Turnbuckles are of the dime-store variety.

Here's the way the jib is attached. A clevis on the fore end of the boom rides on the turnbuckle.



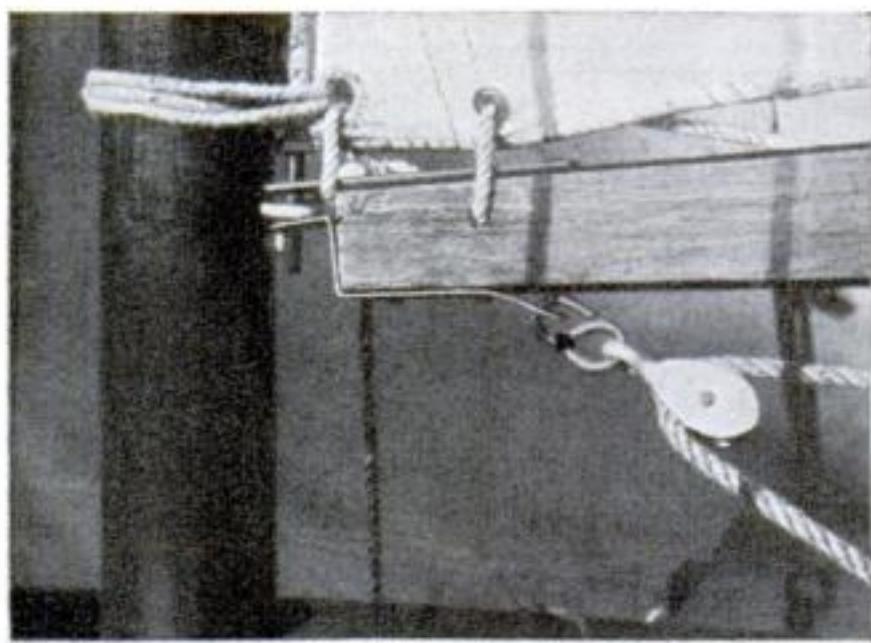
Looped around the mast, the shrouds help hold it upright. The jaws of the gaff straddle the mast.

Rope is used instead of turnbuckles to fasten the side shrouds to the runner plank, for this will ease the shock when a gust of wind hits or a runner lifts. Awning pulleys will serve for the blocks, five singles and five doubles being required. If the necessary 150' of $\frac{1}{4}$ " manila rope is not obtainable, $\frac{1}{4}$ " jute will be adequately strong.

The mainsail is laced to the gaff and boom before being raised, and both spars are removable along with the sail. In rigging the sail, note that ropes which raise the peak and throat of the gaff are secured to cleats on the side of the boat, and that the rope to the jib is tied to another on the opposite side. If you should want to make your own sail, see P. S. M., July 1939, p. 160, or May 1940, p. 176.

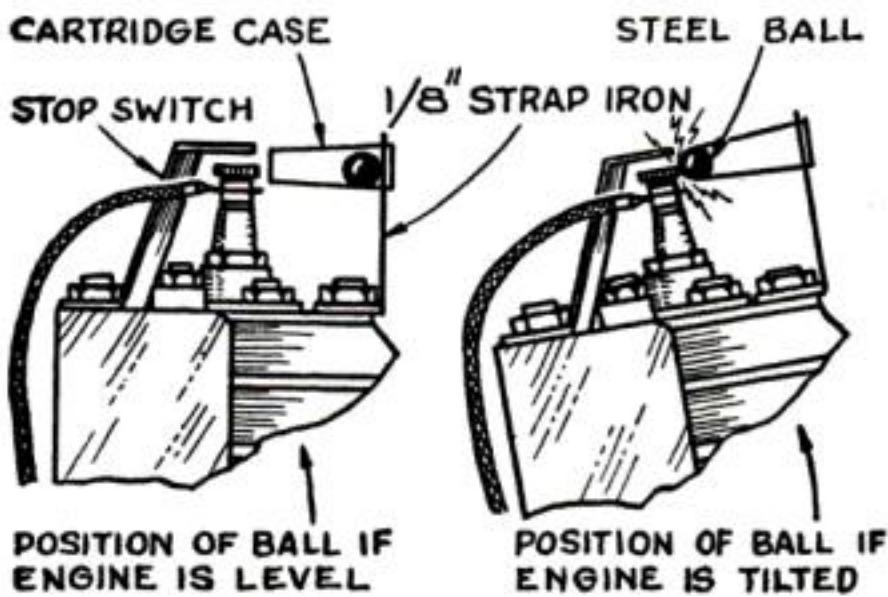
Varnish or paint will complete your boat. On this one, the frame and plank are Chinese red and the spars are black.

Note how a bolt holds the boom to the mast. Both the boom and the gaff are removed with the sail.



WHAT'S YOUR INGENUITY QUOTIENT?

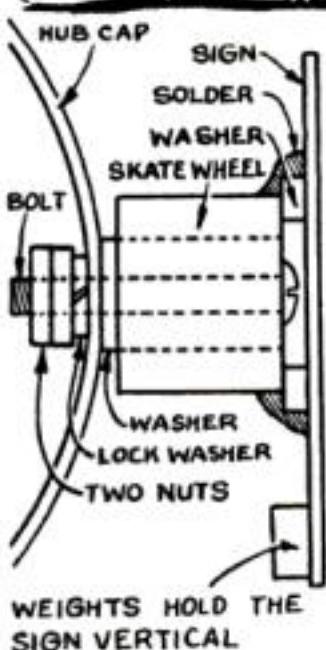
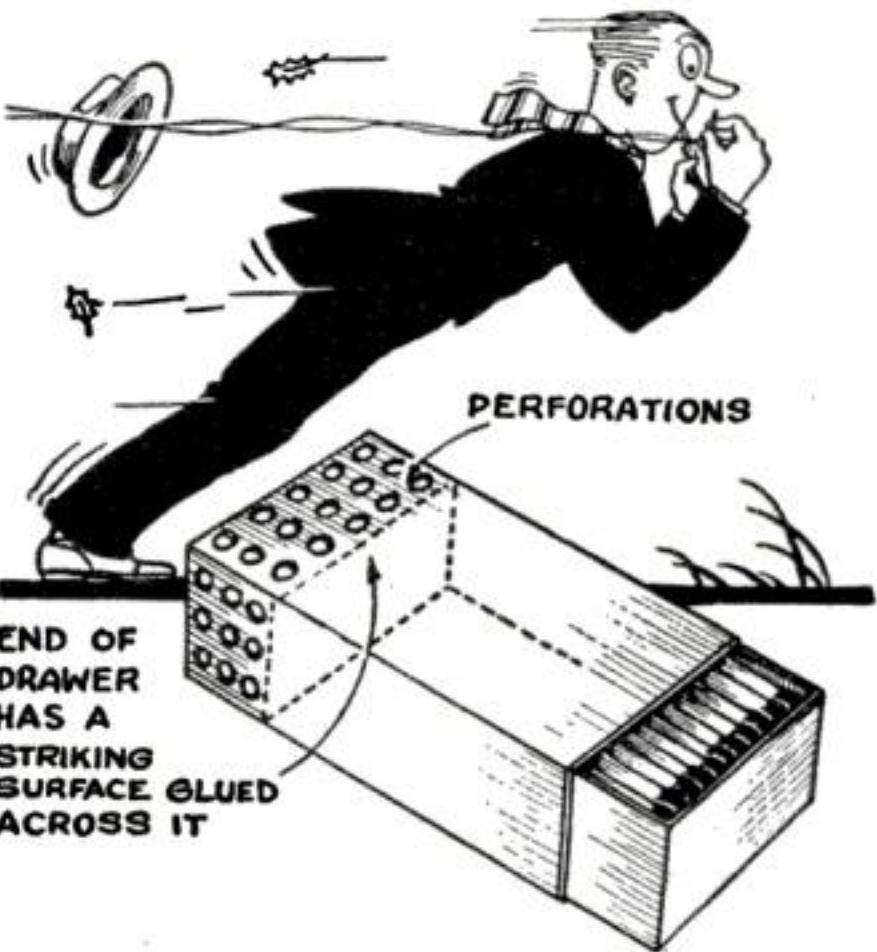
Have you pulled off a smart one lately? We will pay for each contribution accepted for this page showing ingenious solutions of problems in the home, shop, garage, or camp. It doesn't matter if it's wacky—if it works.



PINBALL MACHINES have a way, when you get too ambitious, of lighting up like a flame thrower, sounding a 21-gun salute, and snarling back the big letters "TILT!"

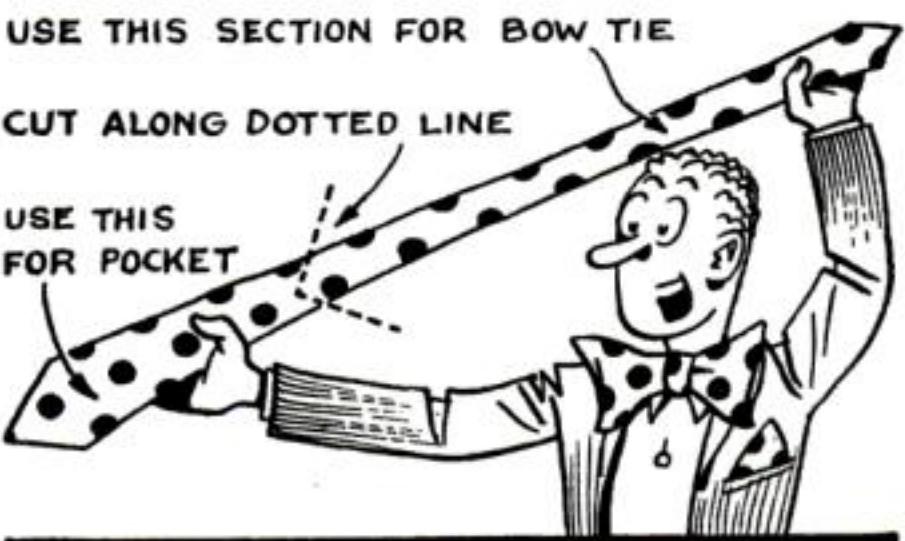
This protective behavior suggested to me the notion above. GI's in my outfit often trundled our portable air compressor about with the engine running. Oil wouldn't feed on the tilt and *blam* would go the main bearings. With my pinball special, the engine stops dead if some unwary soul tries to move it when it's going. A steel ball runs down a .45-cal. cartridge case and shorts the spark plug.—SGT. J. MOONEY.

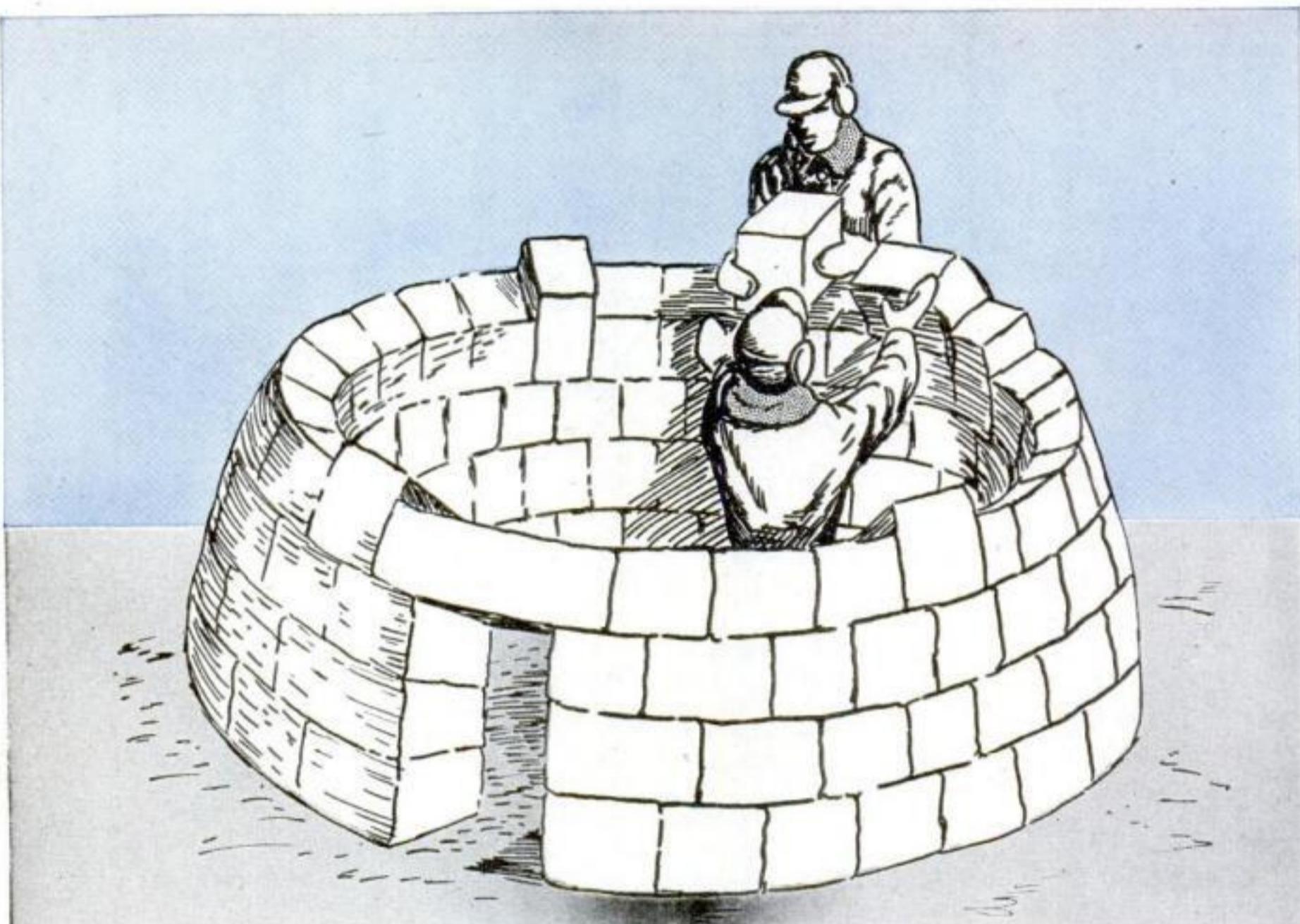
WHEN THE WIND BLOWS, so do my matches. At least they did before a strong wind blew this idea into my head. I took the outer sleeve of a matchbox, perforated it at one end as shown in the drawing, and glued a striking surface across the outside end of a drawer. Now I just dip a match into the recess, and—presto! Zippo! Poof! Sorry, you'll have to poof harder than that. These matches stay lit.—NEVEN JONES.



CAR CARDS are usually placed near the roof of a bus, but not in my bus. I got right down to earth with my homemade advertising, attaching signs to all four hubcaps by means of the skate-wheel arrangement shown at the left. Weights on the placards, plus a little lubrication, keep the signs upright as the car rolls along.—P. L. SIMON.

CAN YOU TIE THIS? When I get tired of a four-in-hand necktie, I cut it into two parts to make a bow-tie and display-handkerchief ensemble. The wide end, snipped off just below the grease line, dangles very handsomely from a breast pocket while the other part continues to protect my Adam's apple from the elements. And—would you believe it?—the two parts of my new ensemble match perfectly—J. N. PARKER.





SNOW IGLOOS FOR WINTER FUN

WHEN you get a really heavy snow, or a succession of snows packs to a 10" or 12" depth, why not try your hand at building a back-yard igloo? Small children will love playing Eskimo in it, while older ones will use it for anything from a "hunting lodge" to a clubhouse. If you want to save yourself some of the heavy work, it might be a good idea to organize a gang of youngsters to help in the construction. At any rate, provide a sled or two to haul the blocks to the building site, for this chore proves very tiring after you have carried several dozen blocks from your snow "quarry."

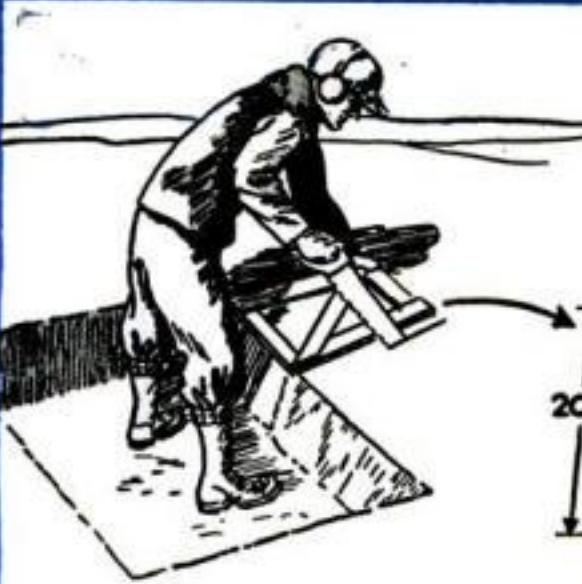
Drive a stake at the center of the igloo location; then with a line tied to the stake at snow level mark off circles of 6' 4" and 8' radius to designate inside and outside wall surfaces. The site must be leveled and soft snow packed down or removed. If the snow is deep and well packed, the lower part of the igloo interior can be dug out and the dome built over it.

The snow blocks are cut from the sides of a pit having vertical walls 12" to 20" deep, as in Fig. 1. Stand in the pit and cut the blocks from the edges, making the side sur-

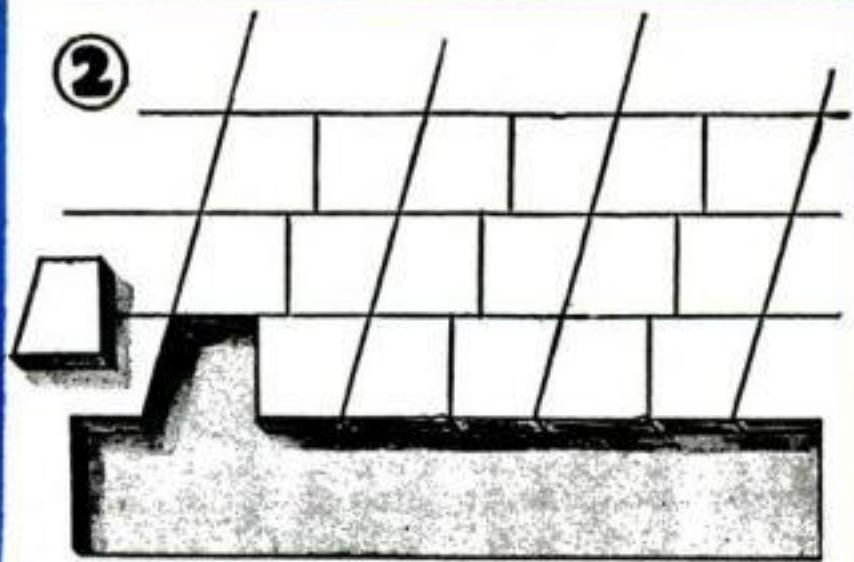
faces perpendicular. It will be a help to use a guide made of scrap wood, as shown. One of the long sides should be square with the two parallel ends and the other at an angle in order to make blocks shaped like those in Fig. 2. The slanting surface of the blocks becomes the top of each tier, and their slope forms the dome naturally.

Place the blocks in a circle, as in Fig. 3, pressing them as close together as possible for firm construction. Apply your measuring line from time to time to be sure all tiers are the same distance from the center, as indicated in Fig. 4. If you note any tendency of the blocks to slip on the higher tiers, wedge in a few double-height ones to serve as keys, as shown in the large drawing above. Space for a doorway is of course left in the foundation. Extra-length blocks above it at about the fourth or fifth tier will provide strength for holding the dome at this point. On completion freeze the igloo for a height of about 4' by sprinkling it with water, but leave the outside rough to catch new snow and gain added strength.

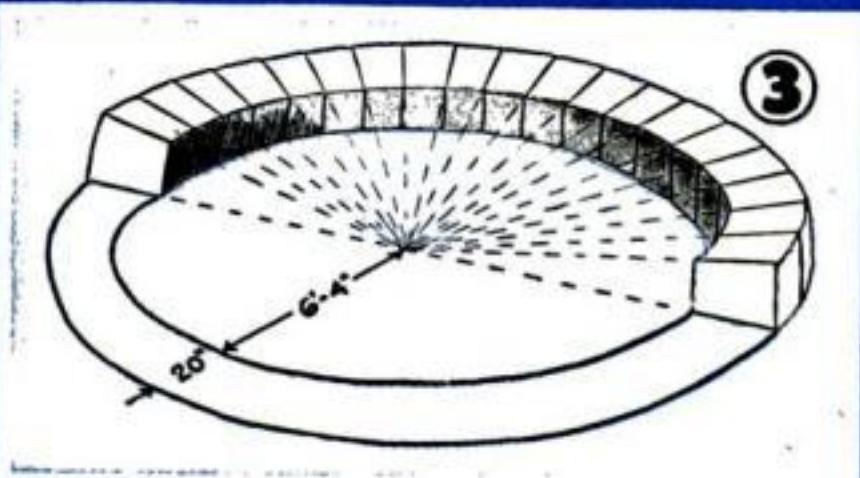
Keep the inside smooth so melted snow will run down the wall instead of dripping. When it becomes glazed, scrape it and



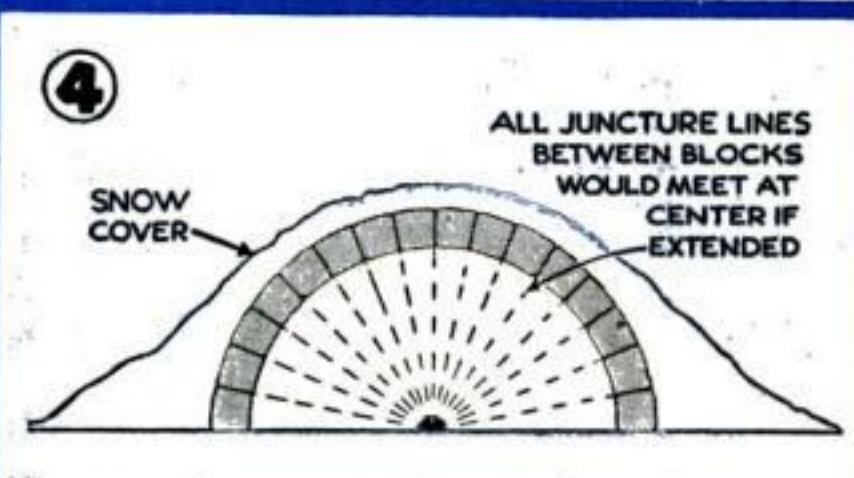
Cutting with a guide makes the blocks regular.



Reverse the guide each time to cut this pattern.



Lay the snow blocks with the slant at the top.



Cross section of the igloo covered by new snow.

plaster with new snow. Leaves, underbrush, boards, moss, and the like make a good insulated floor. Be careful of open fires on such material, especially if the igloo is used by children. Although kerosene lanterns

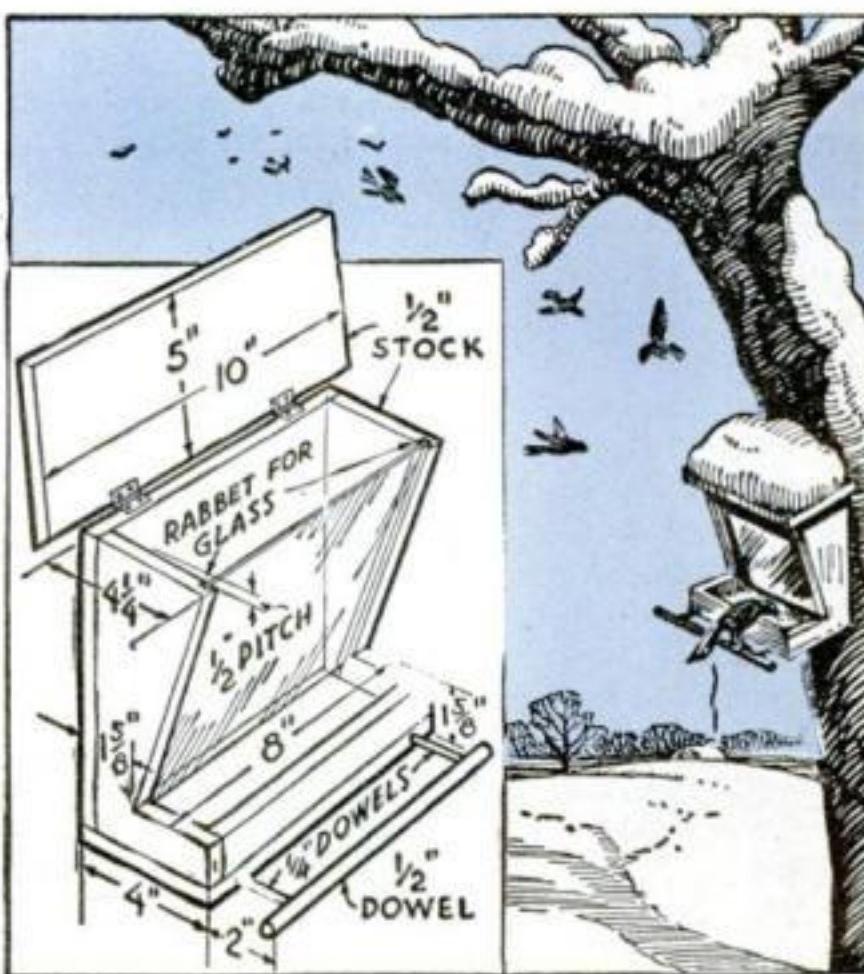
and candles can be used with care, bricks or rocks heated in an outside fire are safer. If an open fire is used inside, shield the dome above it to prevent weakening and possible collapse.—JACK T. HOLMES.

Automatic Bird Feeder Has Grain Bin That Shows Contents

MUCH pleasure can be derived from observing those birds that brave the snows to remain with us in winter. Here is an automatic feeder that will attract them to the trees in your yard by providing them with grain when other food is hard to find.

Make the feeder from $\frac{1}{2}$ " stock. If an 8" by $8\frac{1}{2}$ " board is not available for the back, this part can be made from two pieces edge-glued and reinforced with a cleat. Stop the rabbets for the glass front about 1" from the bottom of the sides to leave space for the grain to go through and keep the feed trough filled. You will be able to tell at a glance when more grain is needed in the bin. The top slopes toward the front and is wider and longer than the reservoir opening to protect the stored grain. A dowel bar provides a place for birds to stand while feeding.

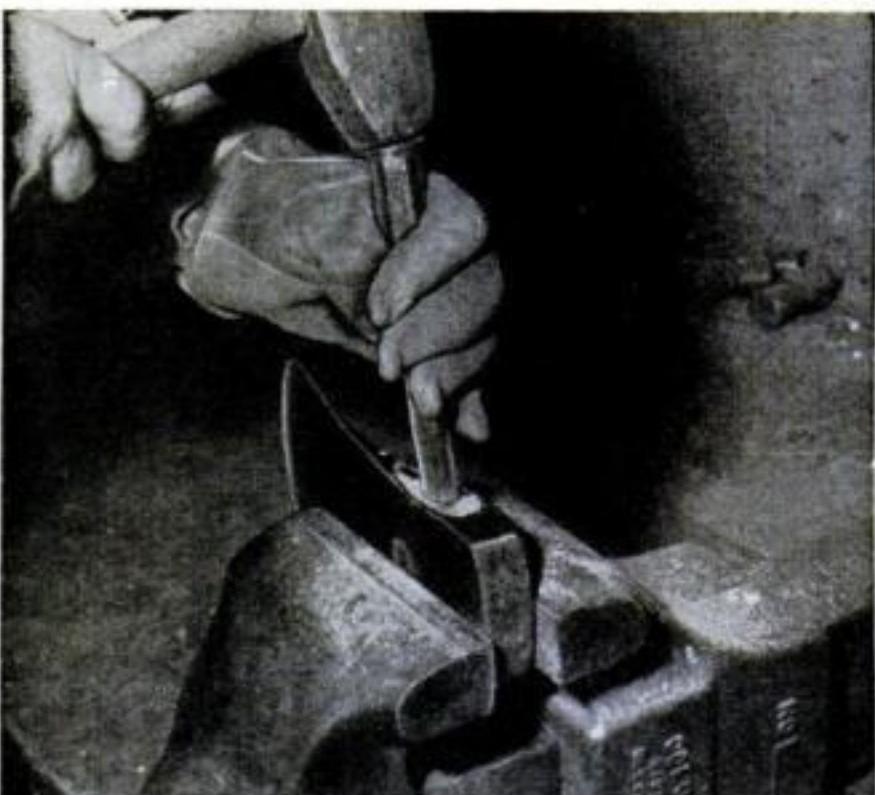
Finish with three coats of boiled linseed oil and hang the feeder by screw eyes inserted in the back.—WILLIAM FREEMAN.



AX HANDLES



1 What do you do when an ax handle is damaged? The best thing is to get rid of it before it causes an accident. Saw it off close to the head, using a hacksaw in case you hit the metal wedges.



2 Then drive out the piece left with a punch and clean off rust with kerosene or rust remover. You will see that the eye is slightly spool-shaped, narrower at the middle than it is at the openings.



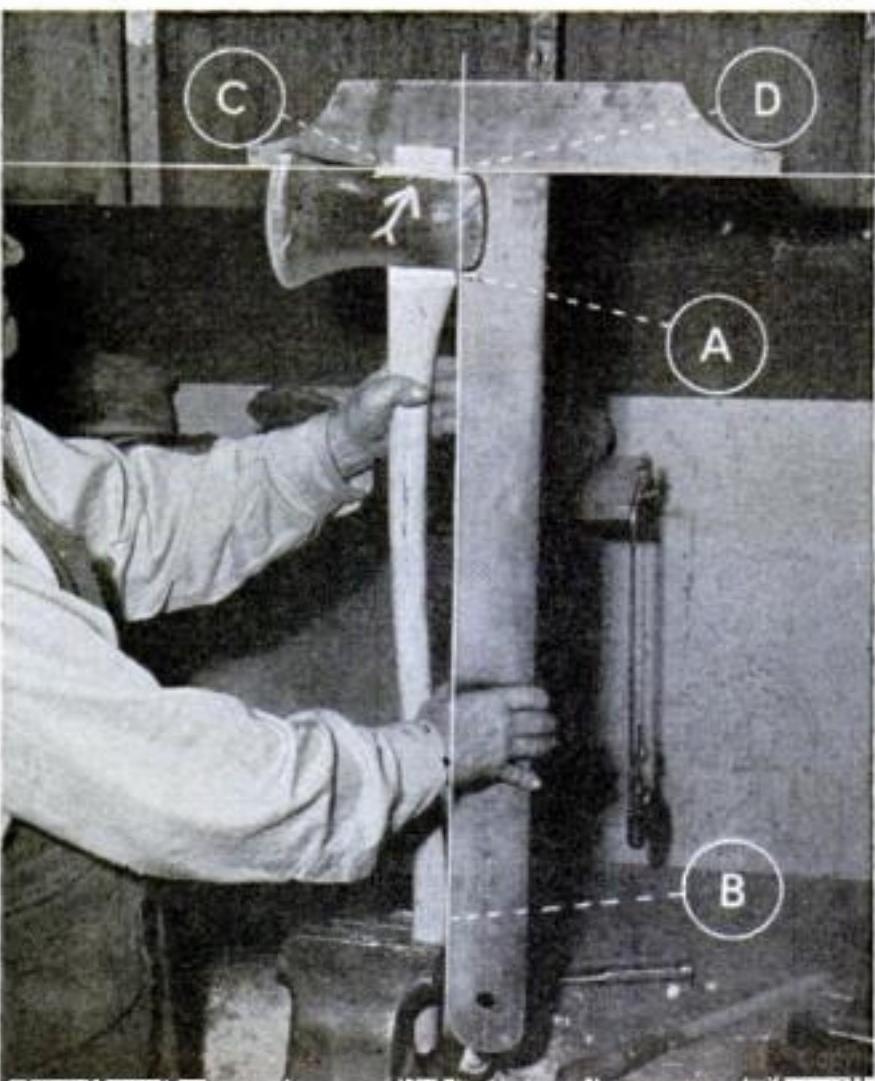
3 Most handles need trimming to fit the eye. A drawknife and rasp can be used. Take a little off at a time, trying the end frequently for fit.

5 Drive the handle little by little, fitting it into the eye as you go by taking off the high spots. To prevent splitting the grip, saw off a small section of the tip where the hammer strikes.



4 When you start driving the handle in, the eye will cause thin shavings to rise. Remove with a rasp, keeping your fingers away from the blade.

6 For correct balance, drive the handle in until only 1" of shoulder is left. It should be just loose enough to move. Line C-D on the head should be square with A-B, from shoulder to grip.



THAT STAY PUT

By RICHARD W. EMERY

Photos by RAY CHAPIN

You Need Only Simple Tools, Together With Some Care and Patience, to Bond Head and Shaft Securely for Service as a Balanced Unit

SOMEWHERE in the average garage or woodshed there is an ax with a loose head or a bashed and splintered handle. Kept in service in bad condition, it is more a potential danger than a useful tool. While the standard treatment for a loose ax head—soaking it for a time in a bucket of water—will help temporarily, it is not a permanent or even satisfactory repair.

And yet it is not much of a job to put in a new handle—and to put it in right so it will stay in. Ten fundamental and easy steps, from removing the old, wobbly handle to the final wedging and trimming of the new, are shown in the accompanying photos. None of them requires tools more uncommon than a hammer, a hacksaw, a draw-

knife, a rasp, or a chisel to do the job well.

The main thing to remember in fitting the handle is to trim the end only a little at a time, trying it in the eye frequently, so you won't get it too loose. Drive it in little by little also, trimming off the shavings that the eye raises as you go.

Once the handle has been driven in the proper distance, square it with the head to get correct balance and to make your swing easy and without effort. Then wedge the end carefully to expand it and fill entirely the space in the head. If this is done correctly, you need never fear losing the head in the middle of a swing, for when a new handle is put in an ax right and tight, it's there to stay put.



7 Keeping the head square with the handle, hold the head in the vise and split the end of the handle with a thin-bladed chisel to provide entrance for a wooden wedge that spreads the end.



8 Make a wedge of wood softer than the hickory of the handle and long enough to reach nearly halfway into the eye. Splitting doesn't spoil it. Drive all pieces in firmly as far as they will go.



9 Using a hacksaw, saw off the protruding end of the handle and wedge flush with the head. The wedge will have spread out the sides so they fit snugly, but the ends will show open spaces.



10 These end spaces are filled up by expanding the handle in that direction with two metal wedges driven in across the wooden one. If space still shows, plug it up with a small wooden wedge.

Smart Jewelry Created by Cementing Sea Shells

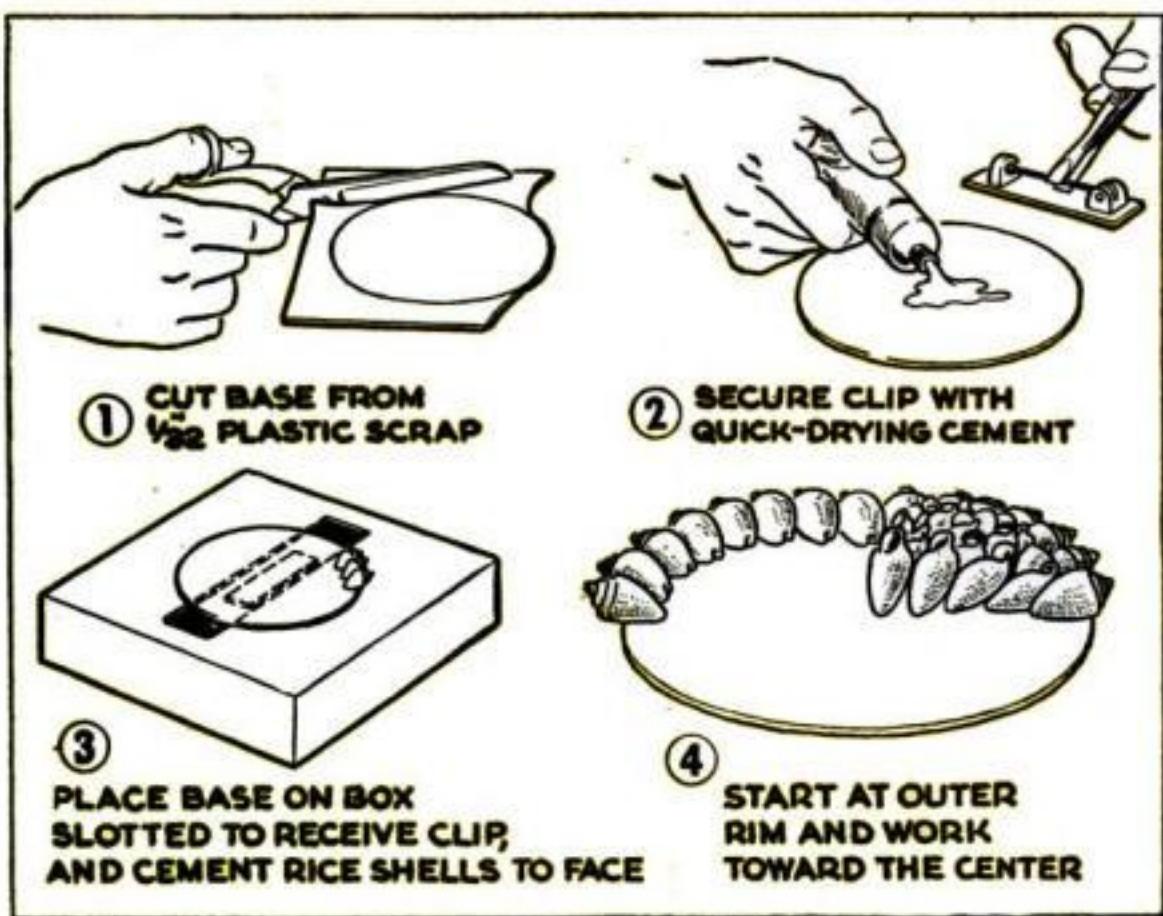
B EACHCOMBING, rarely a monotonous or unrewarding activity, can provide you with materials for wonderfully colorful ornaments, jewelry, and other trinkets. If you have neither shells nor easy access to a beach, look through the classified phone book of a large city under Notions or Novelties—you'll find there the addresses of firms that, for a dollar or so, will sell you enough shells and findings for many projects.

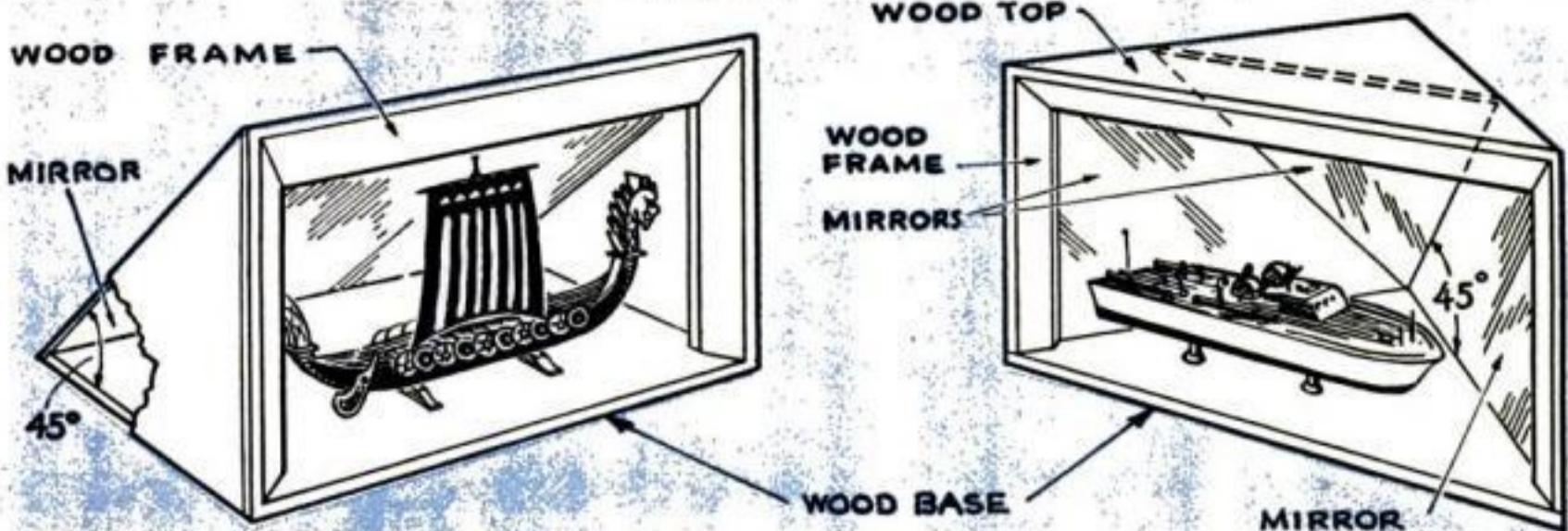
Get some $\frac{1}{4}$ " to 2" clear plastic disks, some plastic links $\frac{1}{4}$ " to $\frac{3}{4}$ " in diameter, and a dozen pin backs and earring clips. These, a handful of small, bright-colored shells and a tube of quick-drying cement are all you need. Start by making a pair of earrings, using tiny shells cemented to $\frac{1}{4}$ " plastic disks. A slotted box, as shown below, permits an earring or brooch to be conveniently built up after the clip is attached.

Once you've got the hang of it, let your imagination take the reins. An ashtray can be made by cementing a plastic link to the bottom of a good-sized shell, or by cementing two such shells back to back. Or a tiny flowerpot may be produced by attaching a colorful link to the base of a helmet shell. An ornamental comb is easy: cement a pattern of brightly colored shells to the side of the comb. A miniature tea set,

complete with teapot, cups, saucers, and tiny spoons, might be placed on a small mirror. Other possibilities include dolls and conch-shell boudoir lamps.—MARIA MORAVSKY.

Shells, pipe cleaners, and a painted-in face make this doll. Other shell creations are shown on page 120.





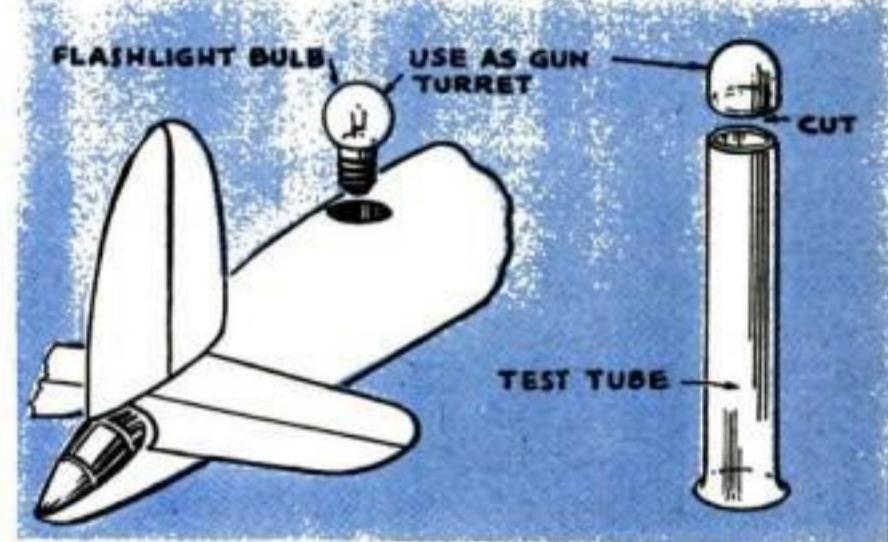
Mirrored Cases Reflect Top and Back of Models on Display

NO "HANDS OFF" signs are necessary if you display your favorite models in cases fitted with mirrors that give an all-around view. For a mantel or the top of a bookcase, an effective case can be made with a 45-deg. back to which a single mirror is attached,

as shown at the left above, while a case shaped like that at right and containing three triangular mirrors fits nicely into a corner. The frame molding may be of any depth suited to the models that are to be shown in the case.—P. B. HORSLEY.

Ends of Test Tubes Serve as Model-Plane Turrets

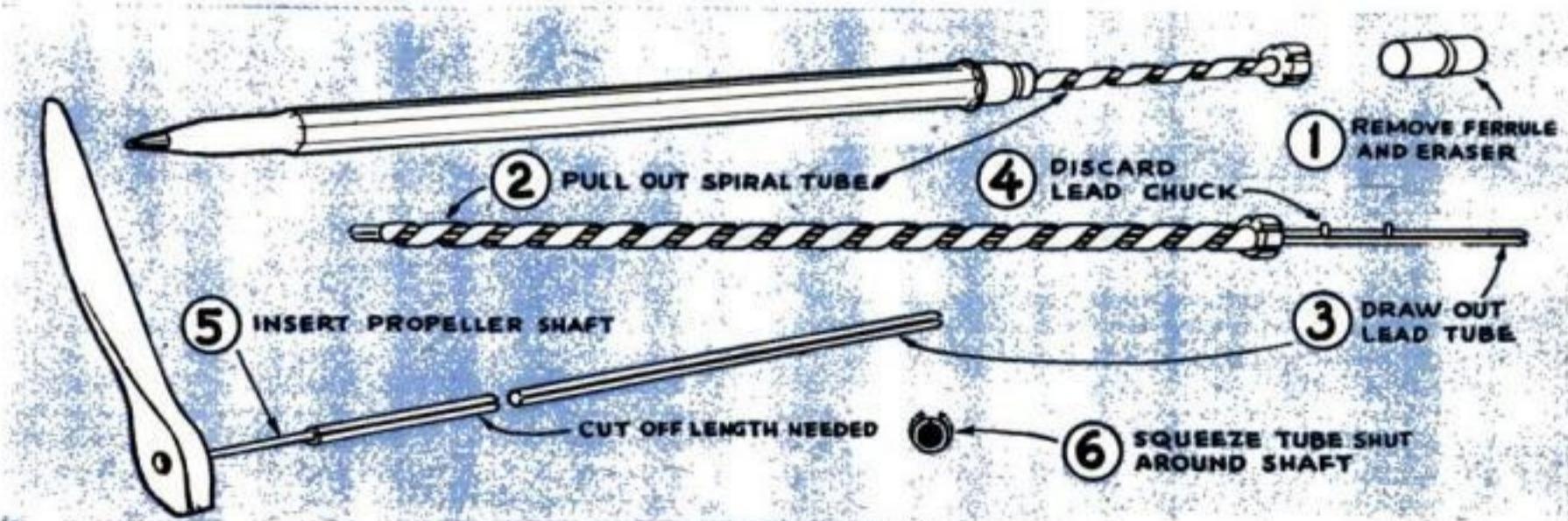
BLISTERS and gun turrets for model planes can be made by cutting off the ends of test tubes and fitting them into suitable holes in the fuselage. One method of cutting the glass is by filing part way through with a triangular file, wrapping with a string soaked in lighter fluid or gasoline, and igniting. Burned-out flashlight bulbs may also be used to make good turrets.—FREDDY MITCHELL.



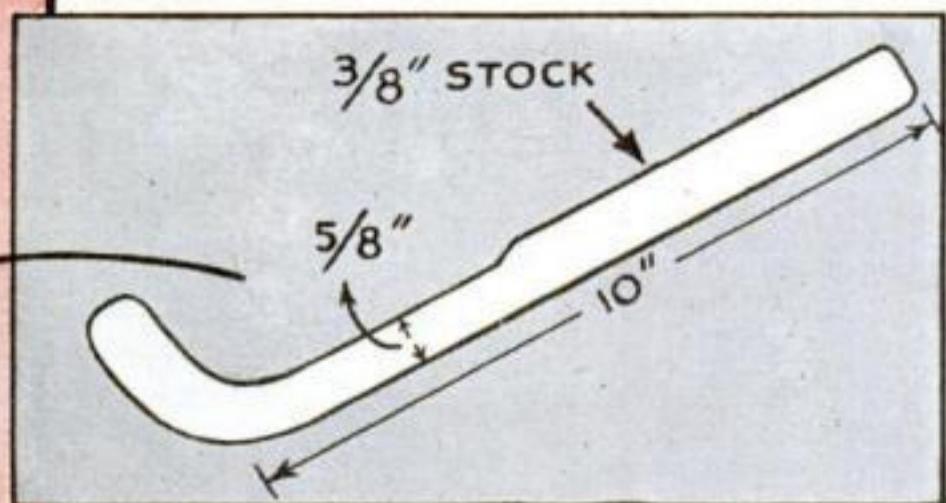
Lead Tube from Mechanical Pencil Forms Bearings for Plane

SEVERAL model propeller bearings, wheel bushings, hinge mounts, and the like can be cut from the lead tube taken from a cheap or damaged mechanical pencil. Disassemble the pencil as shown below and cut off the length of tubing needed. Squeeze the tube

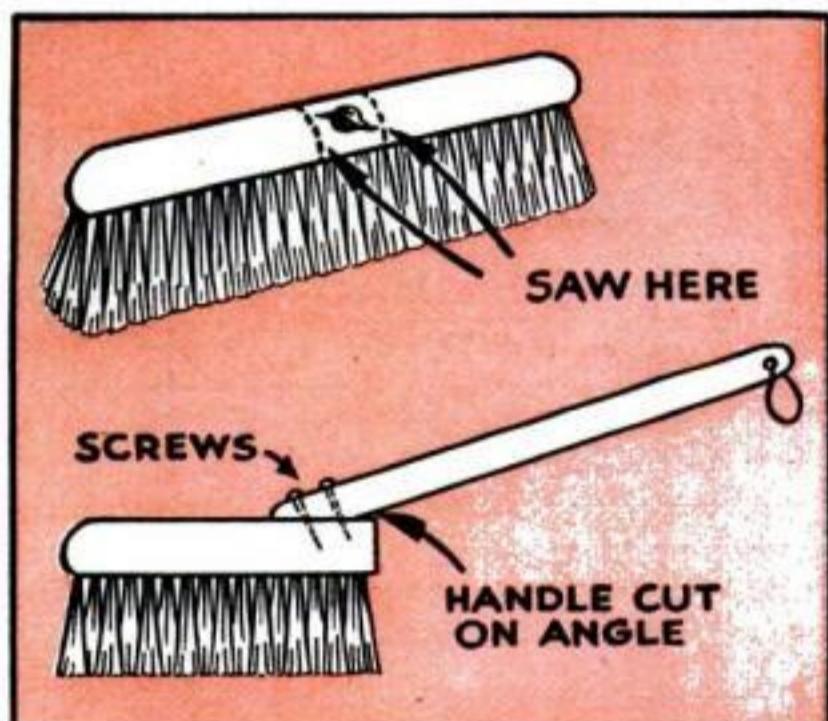
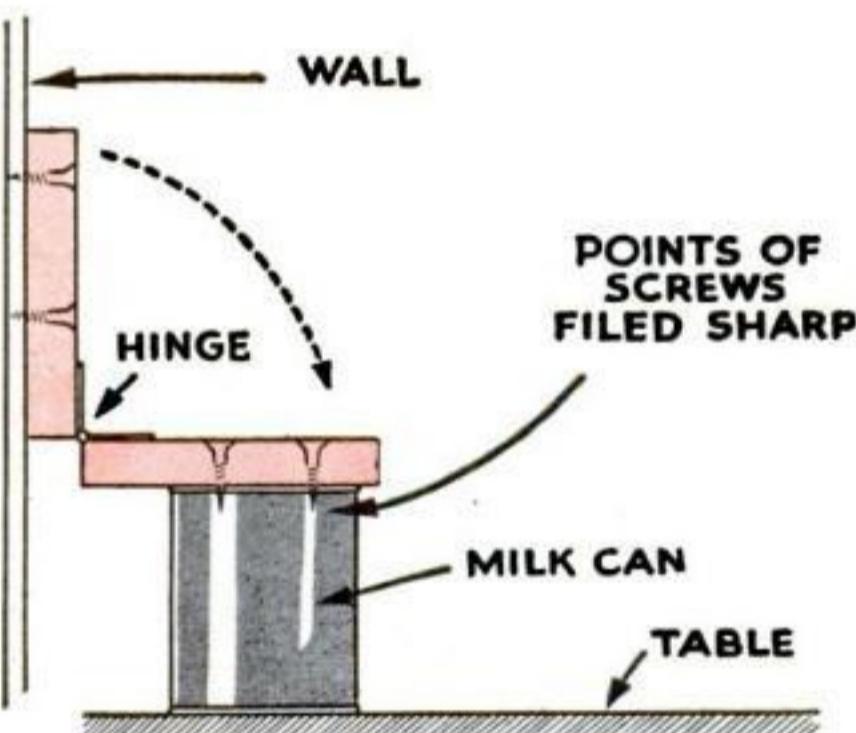
around the shaft with pliers or in a vise until a close but free-running fit for the shaft is obtained. If the hole is still too big, cut through the slot with a hacksaw and again squeeze it shut. Standard and thin-lead pencils afford two tube sizes.—H. W.



KEEPING THE HOME



Scrubbing the inside of a glass coffee maker or a narrow-necked clear vase is sometimes difficult, but with a cleaning stick shaped like this you can reach all parts. Place a wash cloth over the neck of the container and push it in with the stick.



If you use evaporated milk in large quantities, a homemade can puncher will save time. Drill holes for the two punch screws well undersize and attach the hinged blocks to the wall at exact can height.

Two dust brushes can be made from a broken floor brush that has been discarded. Just saw on both sides of the break and add short handles. Part of the old handle or of an old broom can be used.

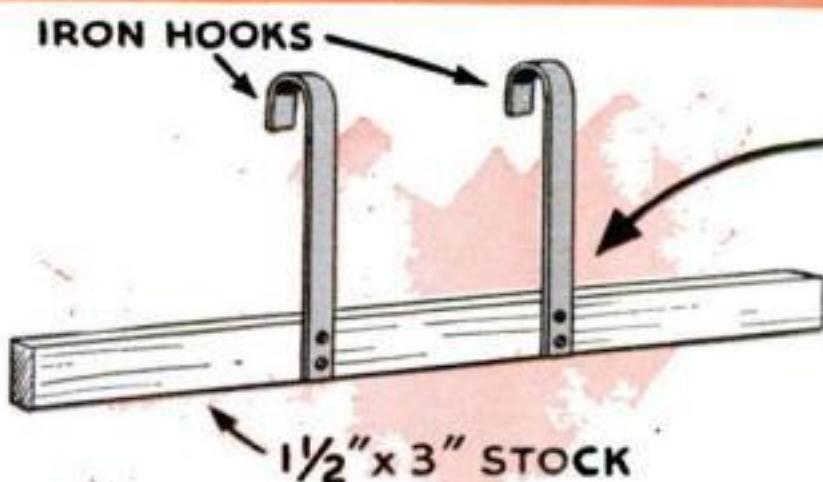
Use of a worn-out feeding nipple on a catchup bottle will give you an efficient clothes sprinkler for ironing day. Burn extra holes in the nipple with a heated needle.

Small, porous drawstring bags of the kind used to ship screws and samples make good containers for soap scraps. They wear well, and water and suds go through easily.

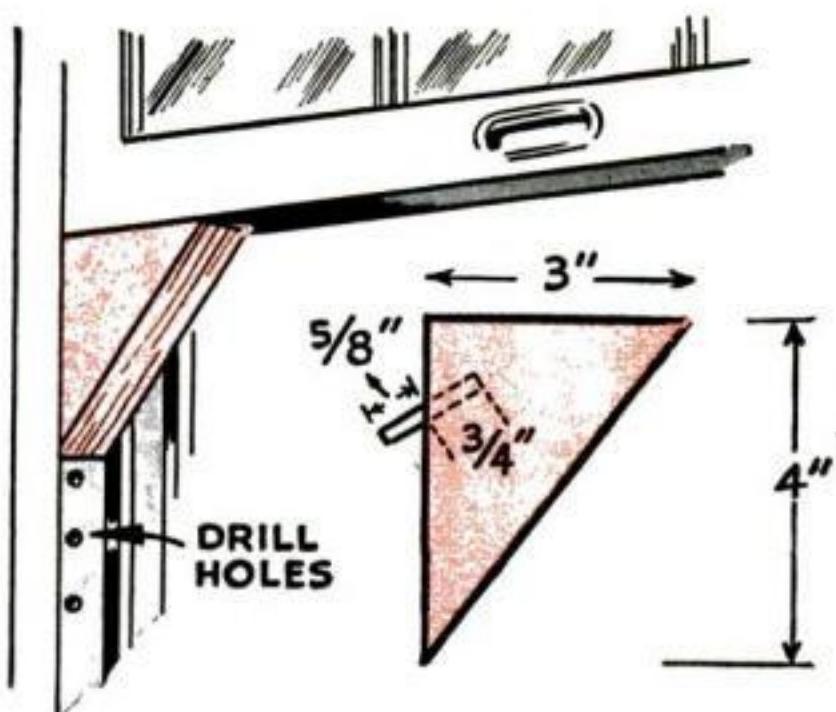
Wood and plastic boxes in which mechanical-pencil lead is sold hold needles safely in a sewing basket or provide a case for a pocketbook hosiery-mending kit.



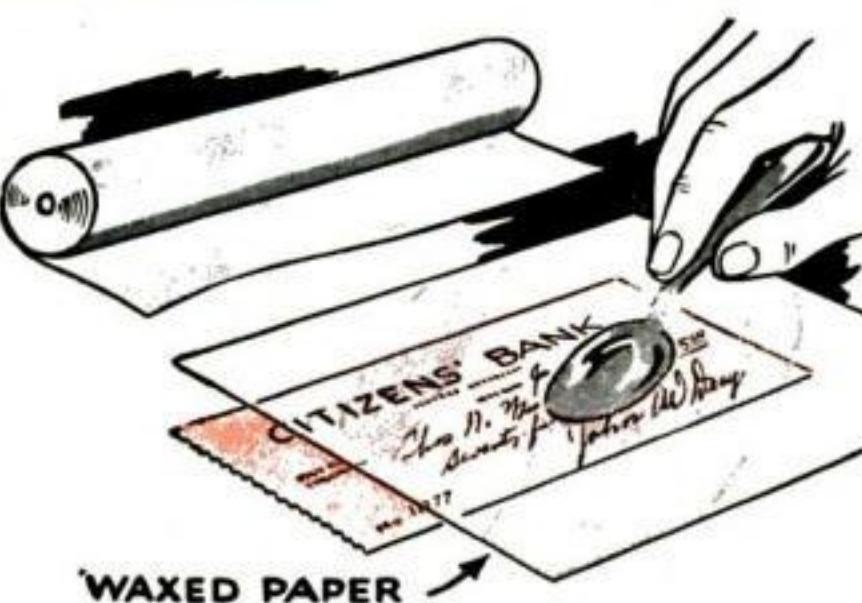
SHIPSHAPE



When you are painting or repairing a window and can't reach the middle readily with the ladder on the sill, the top of the casing, or at one side, try supporting it with a bar hooked over the top rung. Have the bar wider than the window casing.



If it's inconvenient to replace a broken sash cord, a triangular block will hold the window open. Put a dowel or headless nail in the block at an angle. Drill several slanted holes in the track as above.

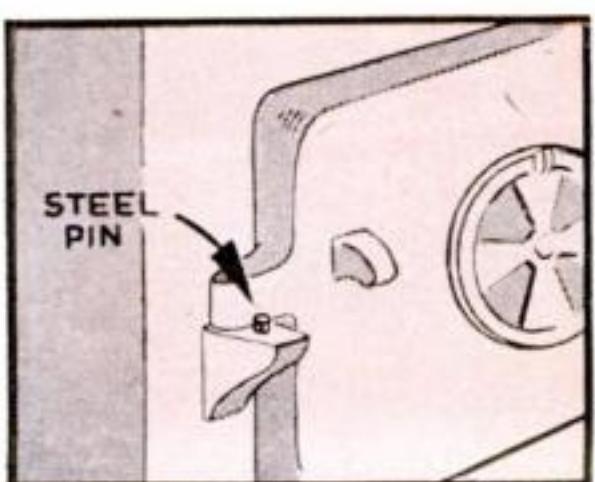


One way to protect household or personal checks from being raised without going to the expense of purchasing a check writer is to rub wax over the amount. Any tampering will then cause a smudge.

If a friction-type latch lets a furnace ash door slip ajar, control of the fire is lost. For positive locking, drill a hole in the latch lug and drive into it a steel pin.

Storage of twigs and other small pieces of wood used for kindling is neater if the wood is tied up in bundles. Make each fagot just the size needed to start one fire.

To unscrew a jammed fountain-pen cap, first wrap both the cap and barrel with a length of adhesive tape, covering up the surface to provide a finger grip.

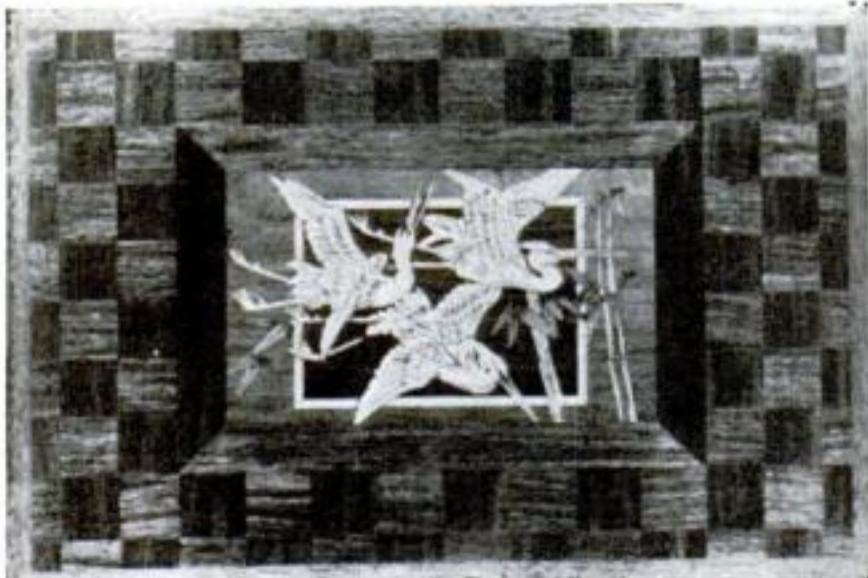


CRAFTSMEN AT WORK



WITCH DOCTOR'S THRONE? No, this horn rocker is the product of an American craftsman of two generations ago. Mrs. George W. Schulte, of Paducah, Ky., says it's still sound after 40 years of use. She got it from the first owner's granddaughter.

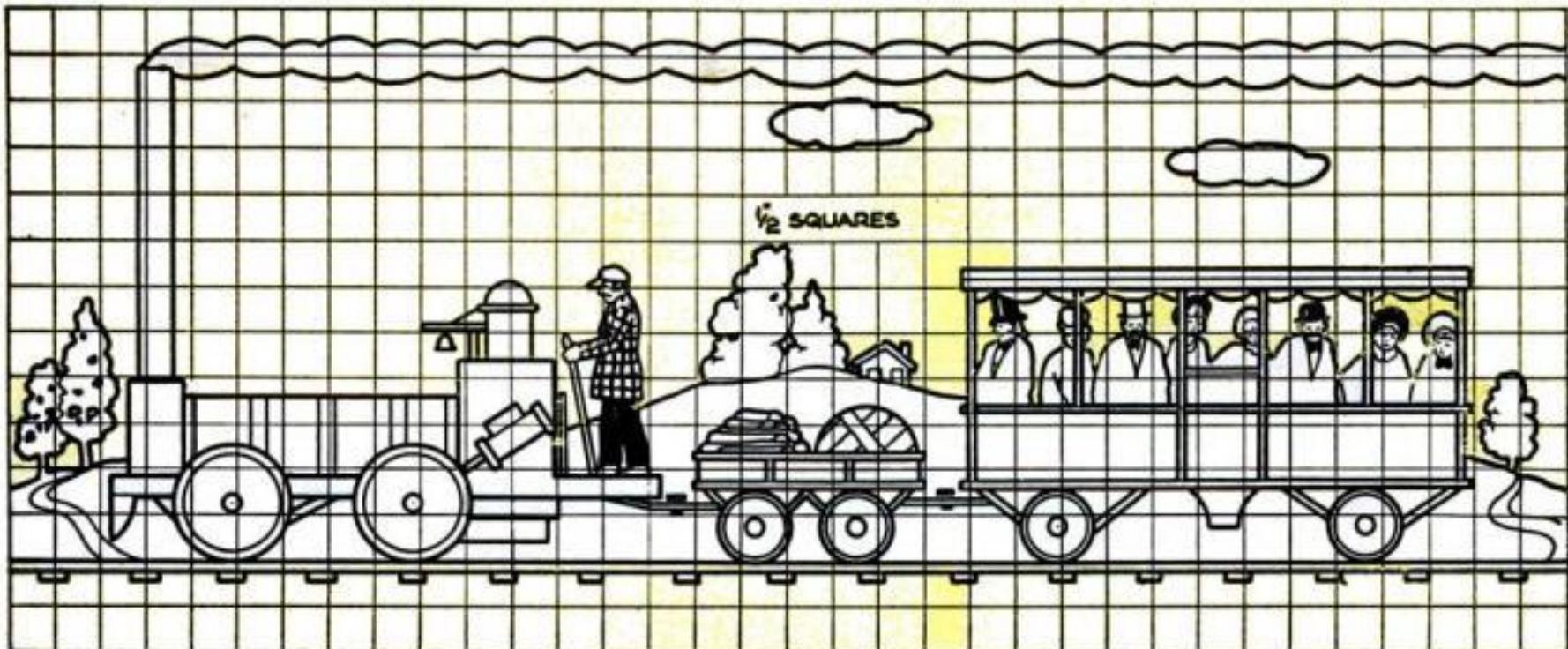
INTRICATE INLAY WORK doesn't scare Arthur E. Erickson, of Lewiston, Idaho, who designed and made the handsome serving tray shown below. He used a total of 451 pieces of $1/28"$ veneer in 10 beautiful woods, some rare and exotic. The 1" squares in a contrasting-grain checker pattern around the central panel are of bright-red East Indian vermillion, and the other woods are walnut, rosewood, satinwood, boxwood, holly, pear, ebony, amaranth, and gum.



RESTORING INDIAN VASES is a scientific jigsaw puzzle enjoyed by 17-year-old Robert Hall, of Green Bay, Wis. He restores ancient Indian pottery by a method he devised himself, using hot wax, bamboo splints, and cotton fibers to fit together hundreds of small pieces obtained by his own archaeological excavations in old caves. His work has won recognition at the Science Talent Institute in Washington, D. C., where he was a finalist in the competition for Westinghouse scholarships.

MODERN ANTIQUE. Craftsmanship of a high caliber is evidenced by a percussion pistol, vintage of 1838, made by Clifford E. Penniston, of Argyle, Wis. It's a real, full-size gun, built from plans of a half-size wood model in the January, 1942, issue of **POPULAR SCIENCE MONTHLY**. Penniston hasn't fired the pistol because of cracks in the metal stock of the barrel, which he plans to replace. He is a member of the National Muzzle-Loading Rifle Association.





Old-Time Engine Design Is Decorative Novelty

By NADINE WALTON

FROM Colonial days through the first part of our national life, our American forebears used color decorations extensively. We may be sure that the railroad motif was not neglected when the iron horse came into being. Here is an original design in the spirit of those times. The fireplace bucket to which it was applied is shown below and also in full color on page 120. Other projects for which the design might be suitable are a fire screen, a hooked rug, needlepoint work, or a painted tray.

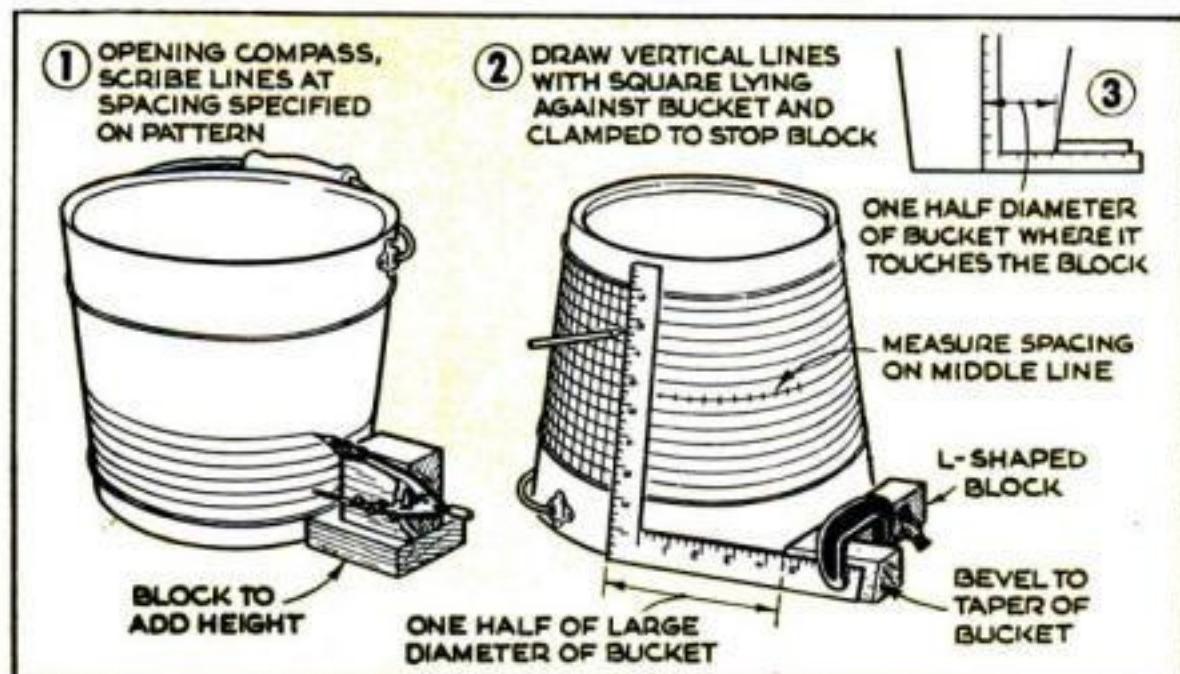
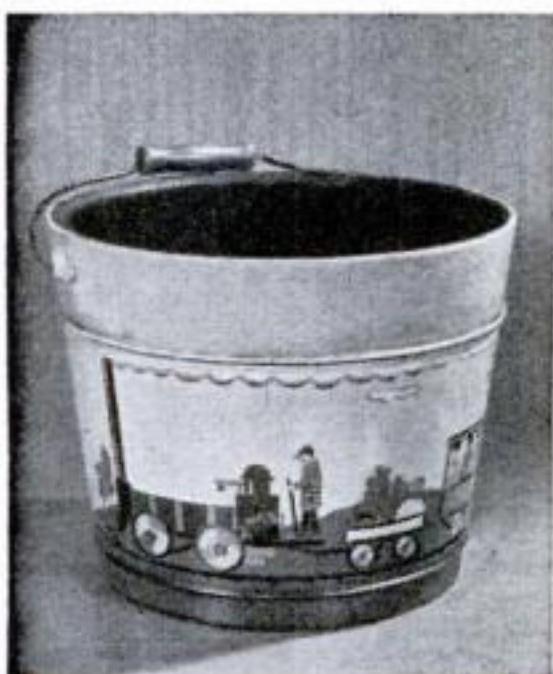
The bucket was purchased unfinished, painted black inside, and given a priming coat and an undercoat on the outside. Then the design was painted on with enamels. A coat of antiquing glaze was applied over all and rubbed into the crevices.

To transfer a pattern given on squares, lay out an accurate grid of squares on the work or on paper. These should be of a size that will afford the desired scale. The pattern is followed on the original squares and drawn in from point to point on the corre-

sponding squares. But on a conical surface like that of the bucket, vertical lines must conform to the taper. The squares will become trapezoids of differing sizes, but if the pattern is traced on them as though they were squares, the result will be satisfactory.

Place the bucket on a flat surface either on its bottom or upside down. Clamp a pencil compass to a block as shown in Fig. 1 and draw it around or turn the bucket to form a base line. Open the compass $\frac{1}{2}$ ", if $\frac{1}{2}$ " squares are wanted, and draw another line, repeating as necessary. When the compass cannot be opened further, put extra blocks under the first.

To make the verticals, mark off with dividers $\frac{1}{2}$ " intervals on a line midway between the top and bottom lines. Cut an L-shaped block with the short leg beveled at the same taper as the bucket, and clamp a steel square to it as in Fig. 2. Place the square against the bucket so that it touches all along the side; then draw the verticals at the points marked. If lugs or handles prevent placing the bucket upside down, use the setup shown in Fig. 3.



TRICKS

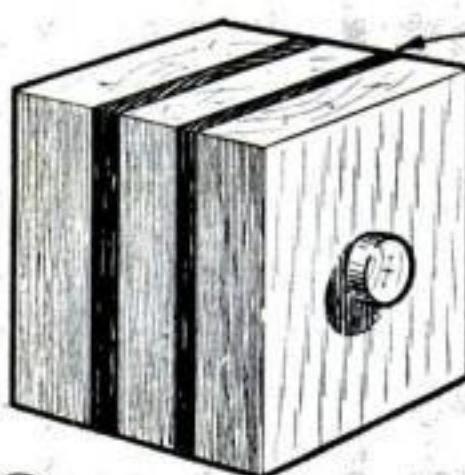
By EDWIN M. LOVE



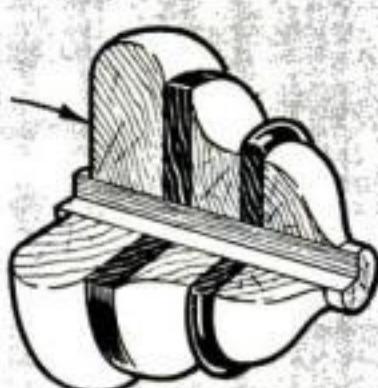
TURNING inlays is a fascinating branch of lathecraft. The intricate and striking patterns that characterize the work result from gluing together strips and blocks of variegated woods to form the turning squares. As the chisel shears through contrasting layers, accidental figures appear, and this element of chance adds to the interest.

More predictable designs in the form of bands of different colors are obtained by assembling wooden washers on a dowel or by gluing together concentric cylinders or

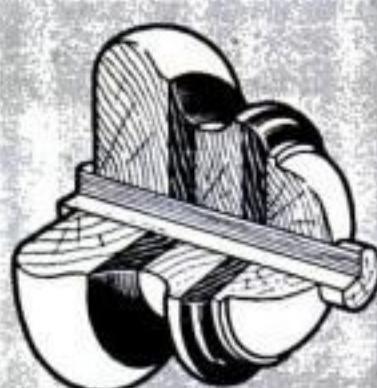
Four methods of gluing up turning blocks to control shapes of inlaid figures are shown below. Left, a turned inlaid lamp.



① DISK ASSEMBLY



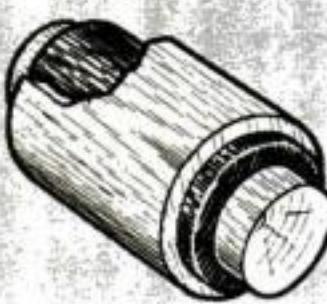
ALTERNATE TURNINGS



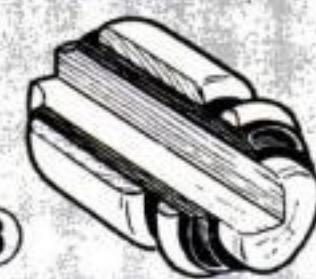
SEGMENTED DISK ASSEMBLY FOR BOWL



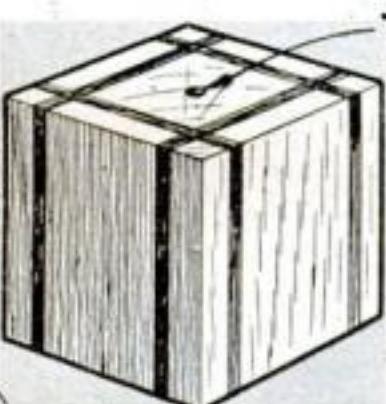
BOWL



TURNING CENTER
CONCENTRIC CYLINDER OR CONE ASSEMBLY



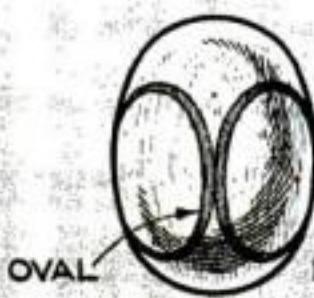
TURNING AS CONE



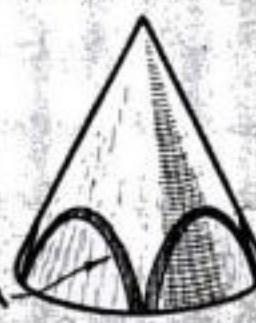
④ GLUED-UP BLANK



CIRCLE
TURNED AS SPHERE



OVAL
TURNED AS ELLIPSOID



PARABOLA
TURNED AS CONE

OF INLAY TURNING

cones. In this way some control over the design is possible, though accidental effects may occasionally appear. A rule or two will aid in planning. First, when a blank is glued up of pieces parallel to its turning axis, circular inlays can be expected on spherical turnings, elliptical on ovals, and parabolic on cones, as shown in the drawings on the facing page. Second, the width of the inlay depends on the angle at which the profile is cut.

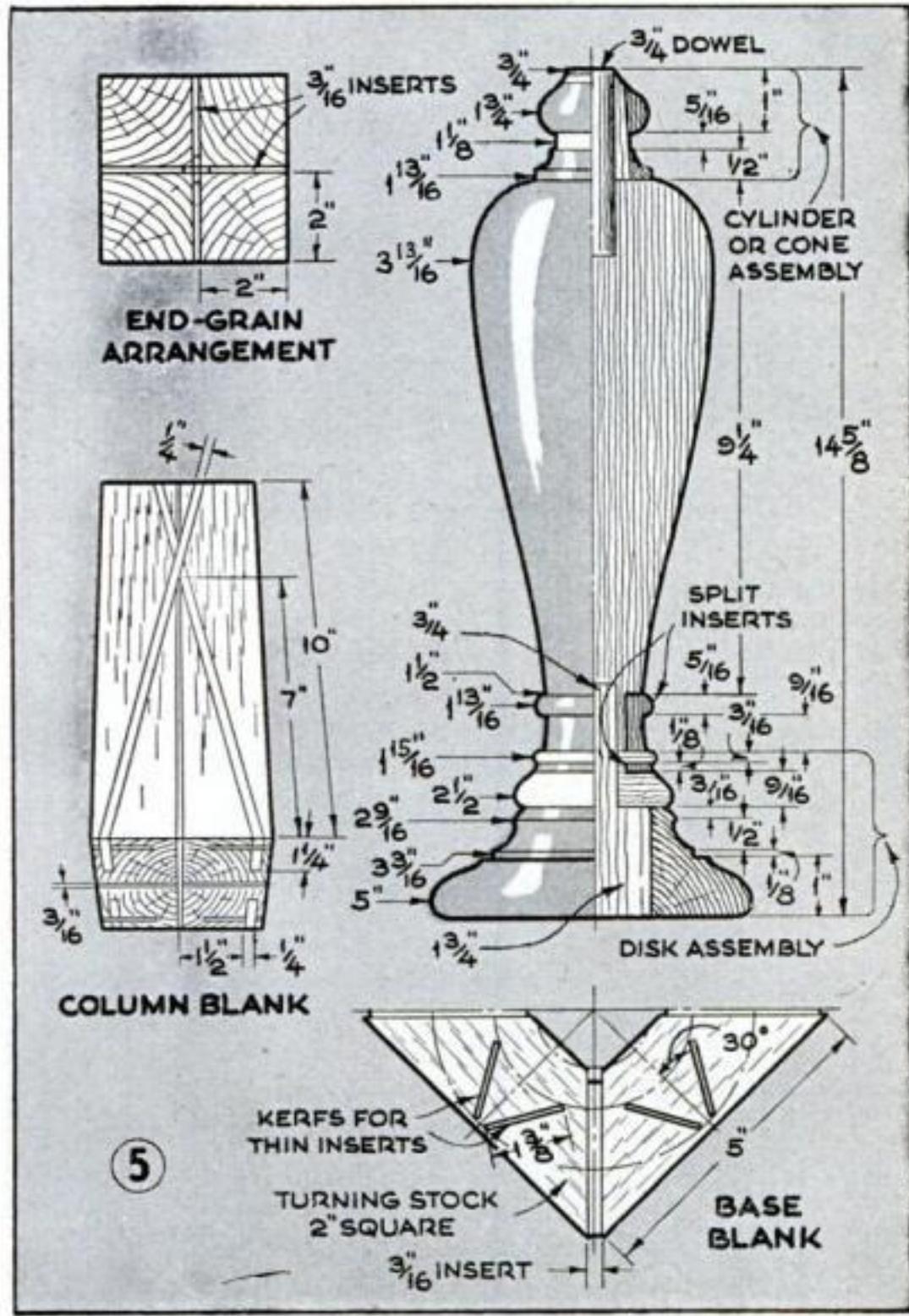
The accompanying photos and drawings illustrate the general method of gluing up turning squares. For the column assembly of the lamp shown, cut four pieces of 2" walnut turning square and arrange them with similar corners grouped at the center, forming symmetrical end-grain patterns.

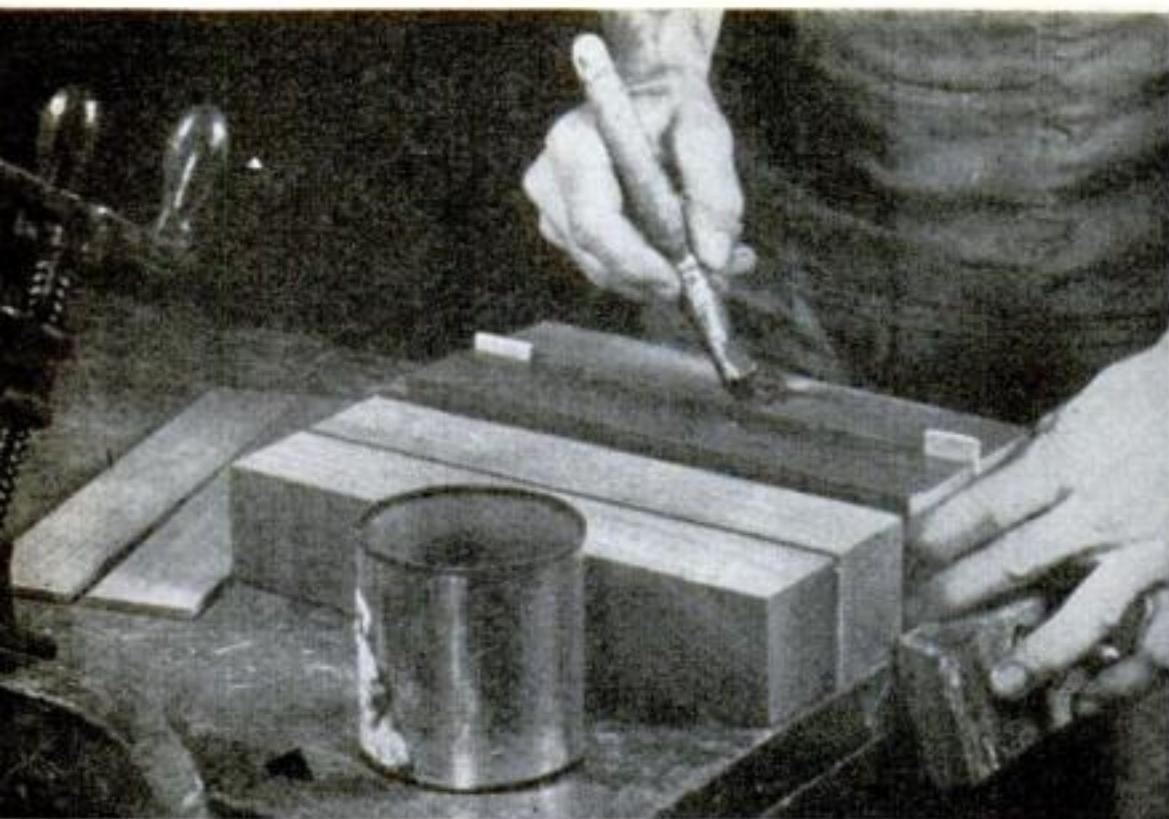
How inlay appears on the lamp when the turning is completed. The standard is made in three pieces: a base, a central column, and a finial at the top.

Mark the two outer faces of each to identify them, and joint the inner faces. Glue the pieces in pairs with a strip of birch or maple in each joint, taking care to align the jointed faces accurately. Note that the inserts are flush with the outer faces but do not extend fully to the inner ones. When the glue has set, joint the halves and glue them together with strips of birch or maple between. To align the joints already glued, insert a short spline at each end of the grooves in the inner faces, as in one of the photos.

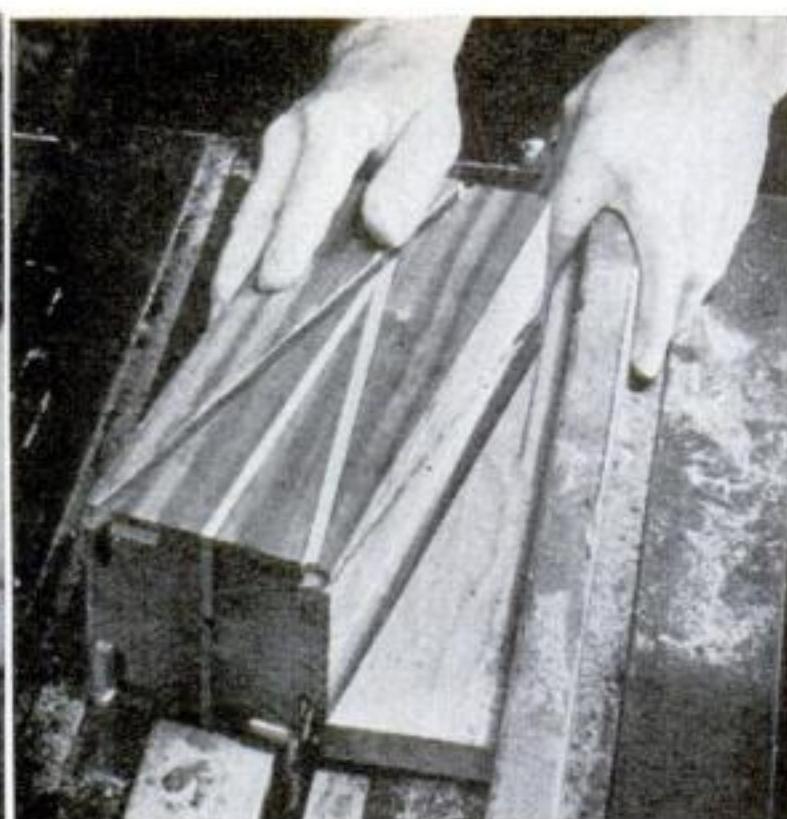
The process can be followed with a limitless number of combinations, each producing a different pattern with any given turning profile. And with any given glued-up combination, a different surface pattern

All dimensions for turning the standard are given below. At left is the glued-up turning square for the column; at bottom, half of the base assembly.

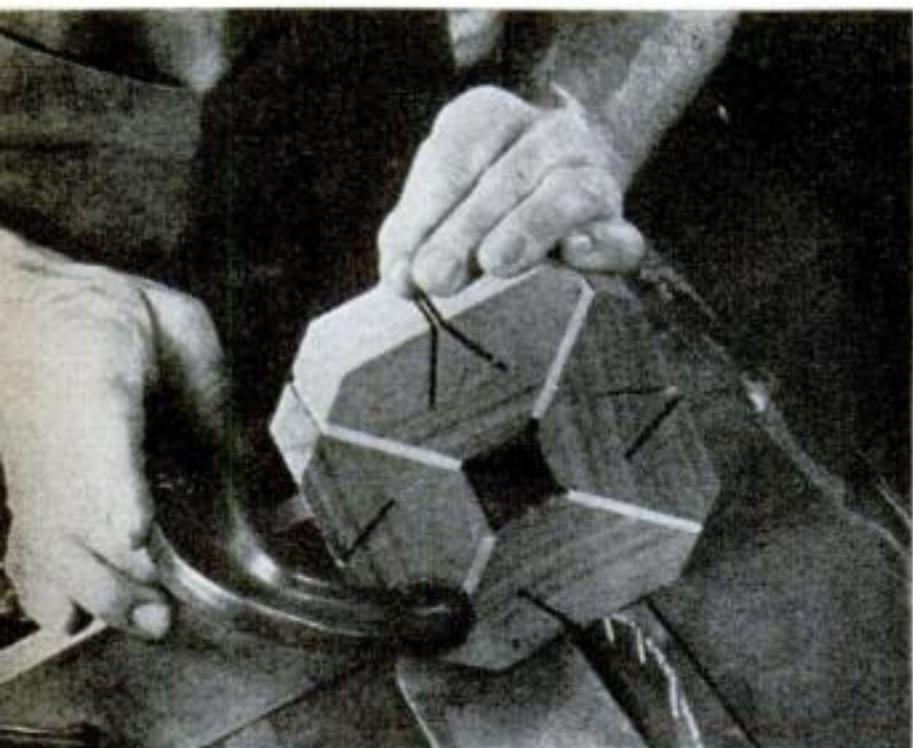




Turning squares are glued up with contrasting strips in the joints to make the lamp column. Note splines inserted to align the joints when glued pairs are finally joined.



In this setup, the glued-up turning square is grooved for crossing strips of inlay in a dado operation similar to taper ripping.



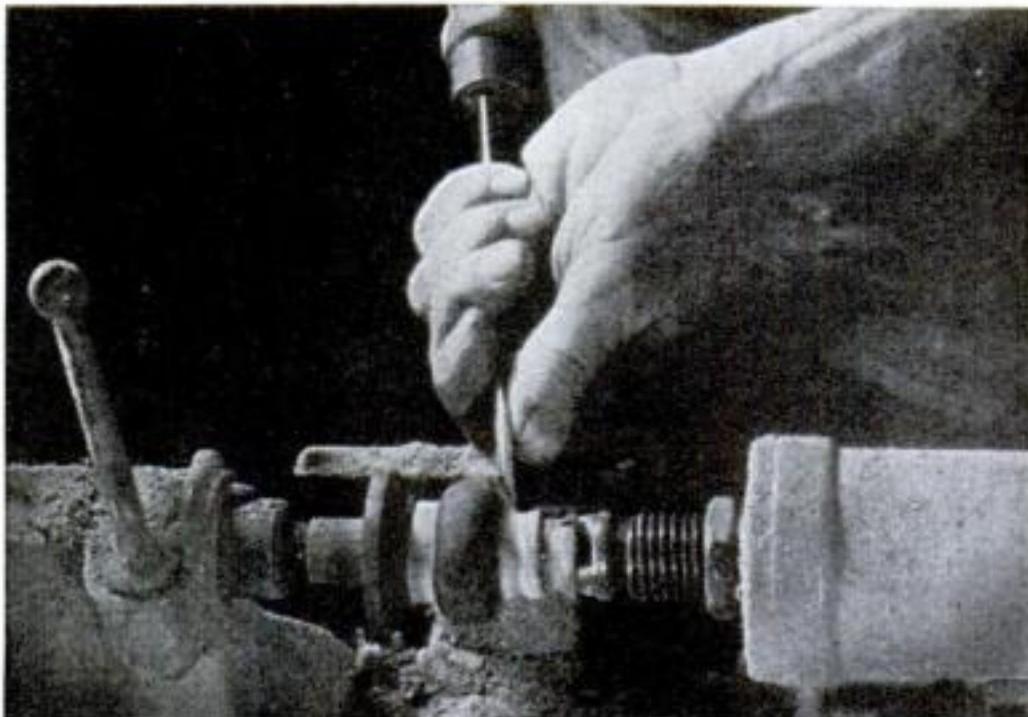
Parts for the base are glued with strips in the joints and kerfed for more inlays.



This disk on a fitted dowel is glued into the turned base to become a band. The cord hole can be bored in the lathe.



When the column and base are assembled, a groove is turned and the halves of a split insert glued in. They become a turned band.



Final turning is done on the top section, or finial, which is made up of hollow cylinders fitted together. Note the contrasting color as the cut goes through the outer layer.

appears every time the profile is modified.

For good results, corresponding strips of wood must be made accurately to dimensions, and glue joints must be strong to look well and to give the necessary solidity for turning. Equally important is accurate centering of both ends, as the slightest irregularity shows on the finished work.

Variety is added to the lamp column illustrated by strips of birch in deep grooves cut on the diagonal with a dado head. This operation is similar to ripping tapers. The work is held at the proper angle by a notched block slid along the fence. With some dado heads it may be necessary to make a special wooden insert that will permit the blade to be raised higher than normal.

Take one cut on each face, glue in the strips, and dress the projecting edges flush with the work. Then reset the fence on the other side of the dado head, turn the notched block over, and cut the other grooves. Set the strips into these cuts, joint off the corners, and turn.

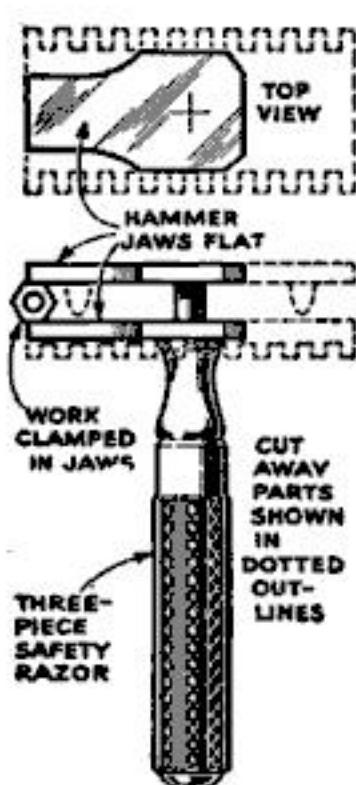
Gluing blocks end to end to carry the grain around the work is a method of assembly for round picture frames, bowls, and the like. It is illustrated in the lamp base. In this turning, four pieces of 2" turning square were cut with mitered ends and grouped for symmetrical arrangement of grain. After careful fitting of the miters, they were sized with thin glue, which was allowed to dry a little, and they were then assembled with strips of birch in the joints. When dry the bottom was surfaced and the face made parallel so either side could be placed against the miter-gauge head and saw kerfs cut for the thin inlays. With both faces trued, the table need be tilted only once to cut the angled kerfs. To facilitate

turning, saw off the corners from the block.

A disk-inlay assembly is built up on a turned core or dowel with disks of the desired thickness bored and glued together. If the assembly is part of a larger turning, it can be turned and glued on afterward. Or, as with the lamp standard, the dowel may be sized, glued into the base on the faceplate, and the piece then turned. The disks can be cut with the grain running through the turning or parallel to the axis. Still another method is to turn a groove in the work, make a disk or blank to fit, halve it with a chisel, glue it into the groove, and clamp. The split joints are invisible after turning, and the inlay can be made into a bead, stripe, or part of a curved profile.

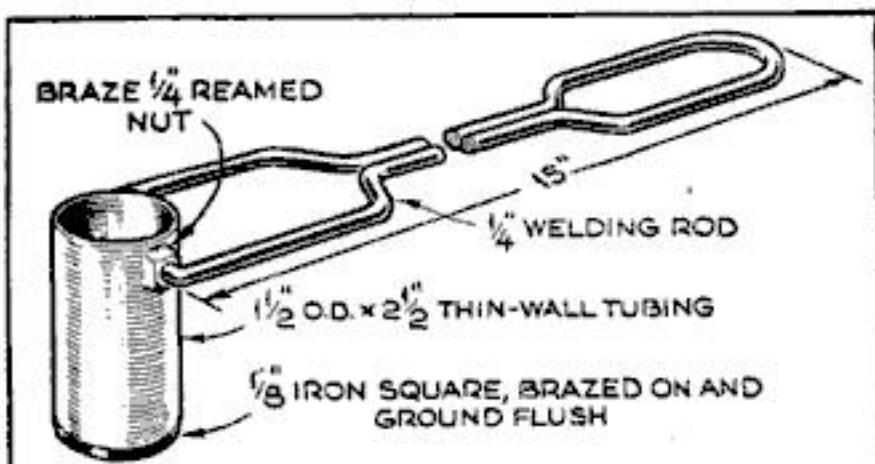
Cylindrical assembly is illustrated in the lamp finial. A core is first turned, and then hollow blocks of contrasting color are turned to fit and glued in place. If the layers are turned as cones, slight oversize boring can be taken up by sliding the parts until they wedge. It is often best to make a shoulder or other break at the juncture of contrasting colors because the borings may be slightly irregular and the banding divisions may not be clean as the tool cuts through one layer into the next.

If an inlay turning is to be stained, woods that are not to receive the stain should be covered with white shellac, a process that calls for careful work with a small brush. On woods contrasting naturally, a thinned coat of varnish may be sufficient. After the varnish had dried, the walnut of the lamp standard was treated with dark-oak filler, which was carefully rubbed off, and then sanded when dry with 6-0 garnet paper to remove all traces of filler from the light wood. A final coat of varnish was rubbed with pumice and water to a satin finish.



HAND VISE MADE FROM RAZOR

SAFETY razors of the three-piece type can be made to serve as handy clamps or hand vises for small, light work. The razor could be used without any modification other than removal of the two prongs of the upper jaw, but a more convenient tool will result if the parts are cut away as shown and the jaws hammered flat.—R. C. ROETGER.



HANDY SOLDER LADLE MADE OF THIN-WALL TUBING

SAW tubing to size, and then braze on and grind the bottom. Bend the handle with the aid of a torch, leaving clearance for the pot to swing completely around between the handle prongs.—W. A. GRECULA.



Six .50-cal. machine guns are underneath the nose to keep gun flash from affecting the pilot's vision.

Shooting Star—Speed King of the Air

By PAUL PLECAN

ONE of Uncle Sam's latest warbirds, the Lockheed P-80 Shooting Star is also one of the fastest. With glass-smooth "piano" finish, clean aerodynamic lines, and a powerful jet engine, it will do at least 550 miles an hour—its top speed hasn't been announced. The plane was designed to operate at altitudes above 45,000' and, with droppable fuel tanks, to accompany long-range bombers. Its graceful lines make it an excellent project for the modelmaker.

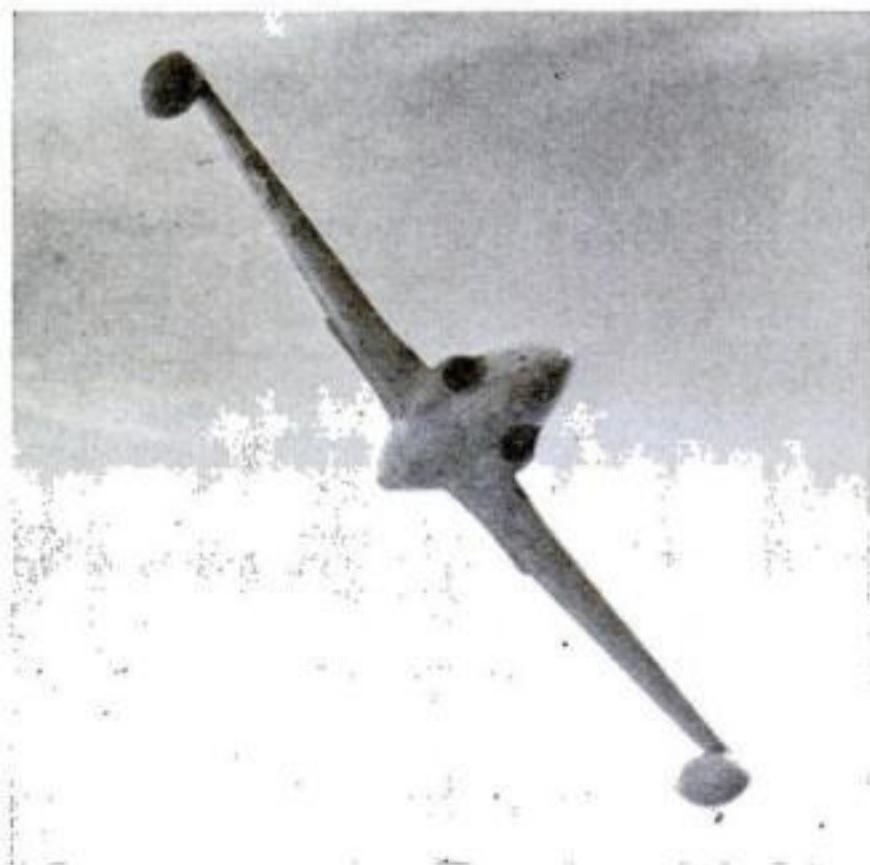
The plans shown on the facing page will have to be enlarged, since they are half size. This can be most conveniently done by having a photostat made. The next best method is to complete the squares on the drawing, draw accurate $\frac{1}{2}$ " squares on another sheet, and then transfer the designs to that sheet for use as a pattern from which to work.

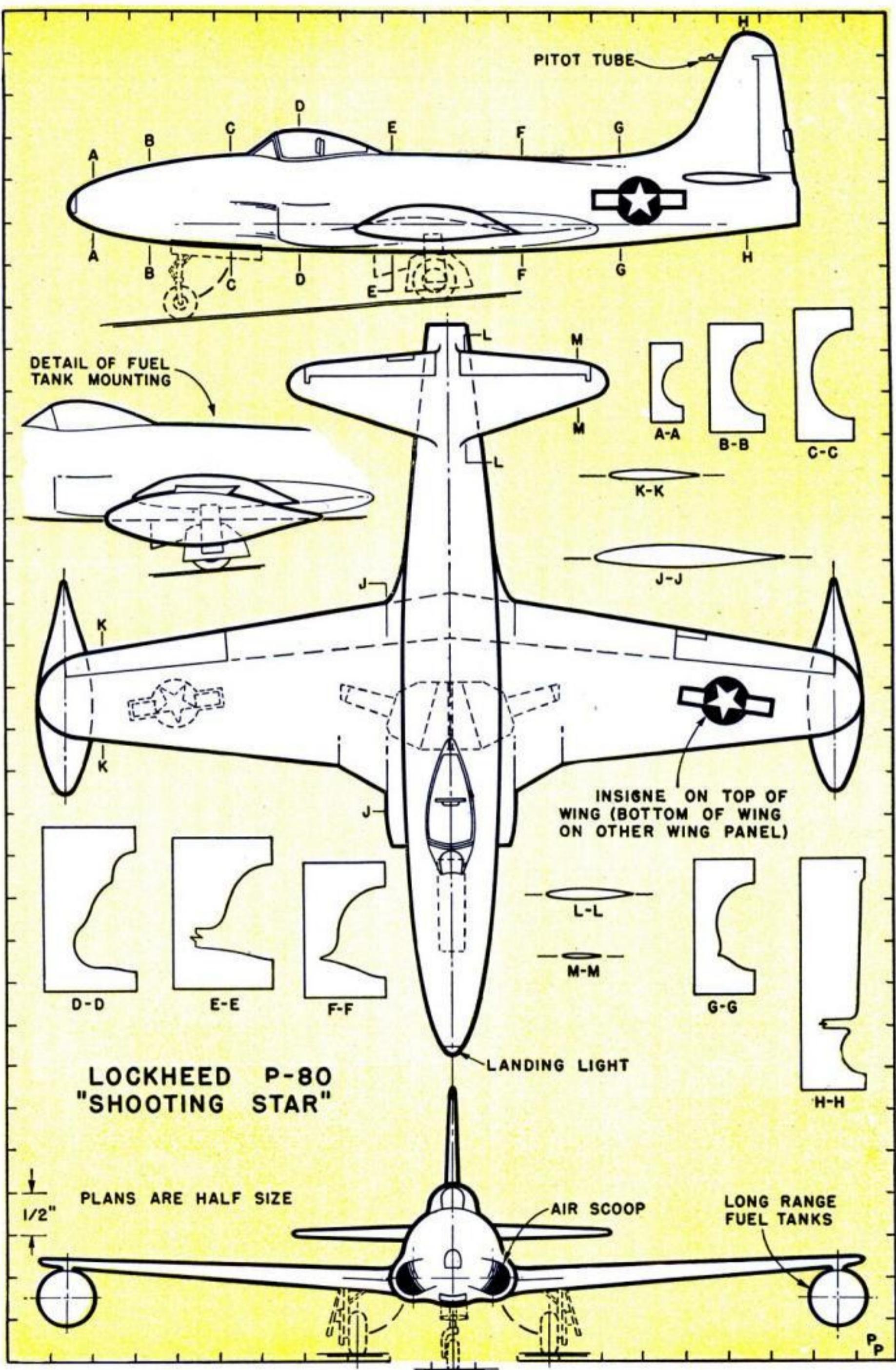
Time will be saved and the work made easier if the fuselage and air scoops are carved separately and joined on assembly. A slot should be cut through the fuselage to take the one-piece wing. The tail surfaces can next be shaped and mounted in place. Then, after the wing and tail have been checked for alignment, the extra details, such as the long-range fuel tanks and landing gear, can be added.

The entire model should be coated with

wood filler after assembly to hide the pores of the wood. Several coats of gray dope are next applied, sandpaper being used between coats to produce a satin-smooth finish. Then the insignia may be put on. Decals are available in most hobby stores and offer the easiest way. Finally, to obtain a glossy finish comparable to the prototype, apply a good grade of automobile polish.

Droppable fuel tanks are under the wing tips, a placement that reduces tank drag 40 to 50 percent.





SERVICEMEN AND VETERANS SEEK CRAFTWORK PRIZES

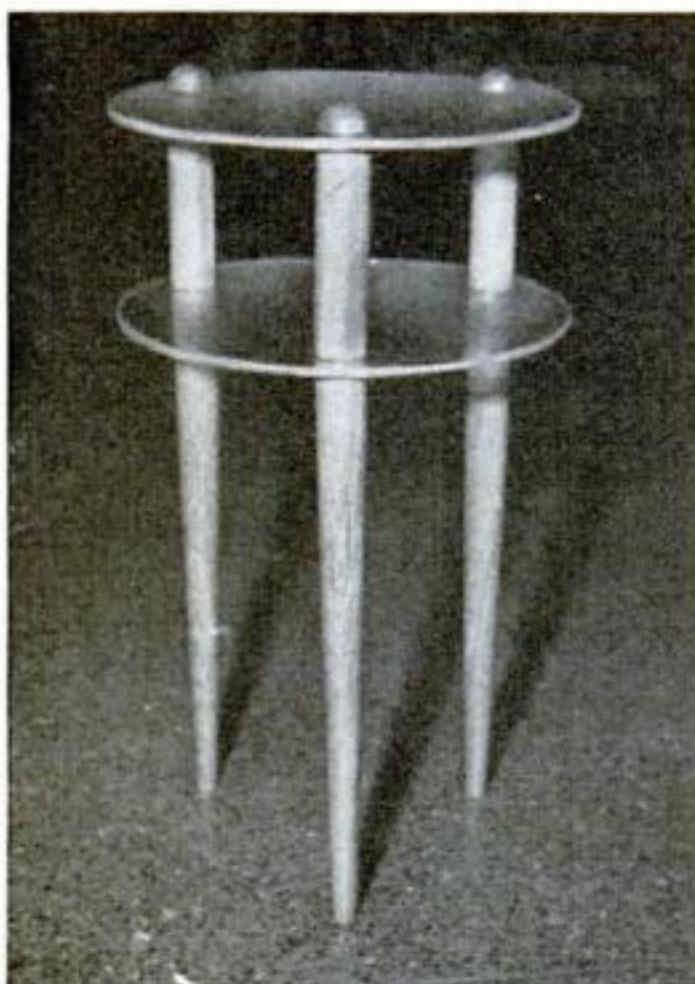
FOR THE best examples of craftwork by members of the armed forces, POPULAR SCIENCE MONTHLY is offering \$3,300 in prizes. So, if you are or have been a serviceman, why not submit that prized gadget you made? You lose nothing—and you may win \$1,000. But first, please read the contest rules carefully. They were printed on pages 150-151 of our December issue and can still be obtained by writing to POPULAR SCIENCE MONTHLY, 353 Fourth Avenue, New York 10, N. Y. The photos below show typical projects produced by servicemen.

\$3,300 IN PRIZES

First	\$1,000.
Second	500.
Third	200.
Fourth	125.
Fifth	100.
Sixth	75.
Seventh	50.

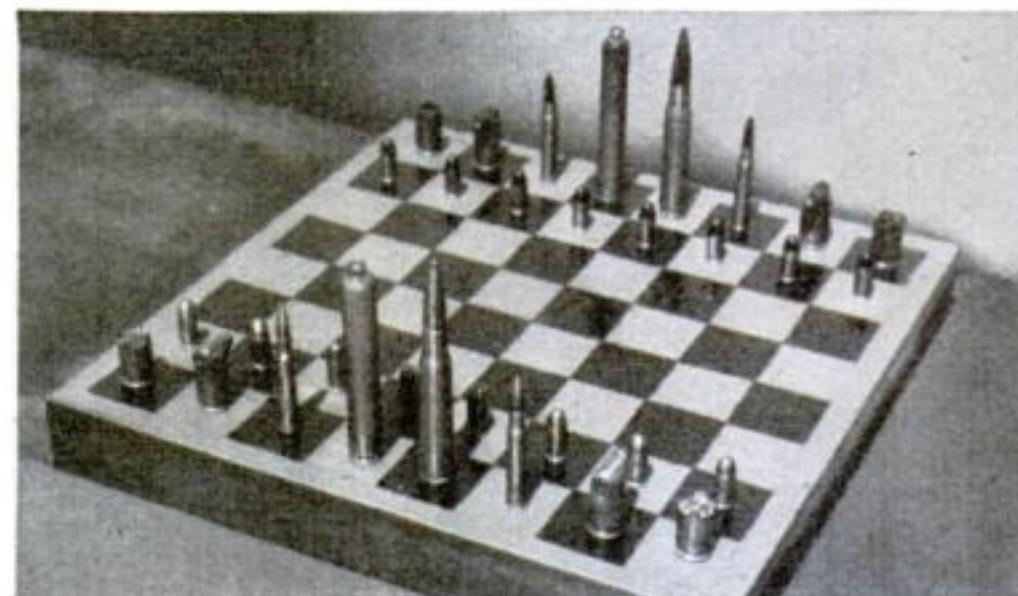
And 50 other awards of \$25 each.

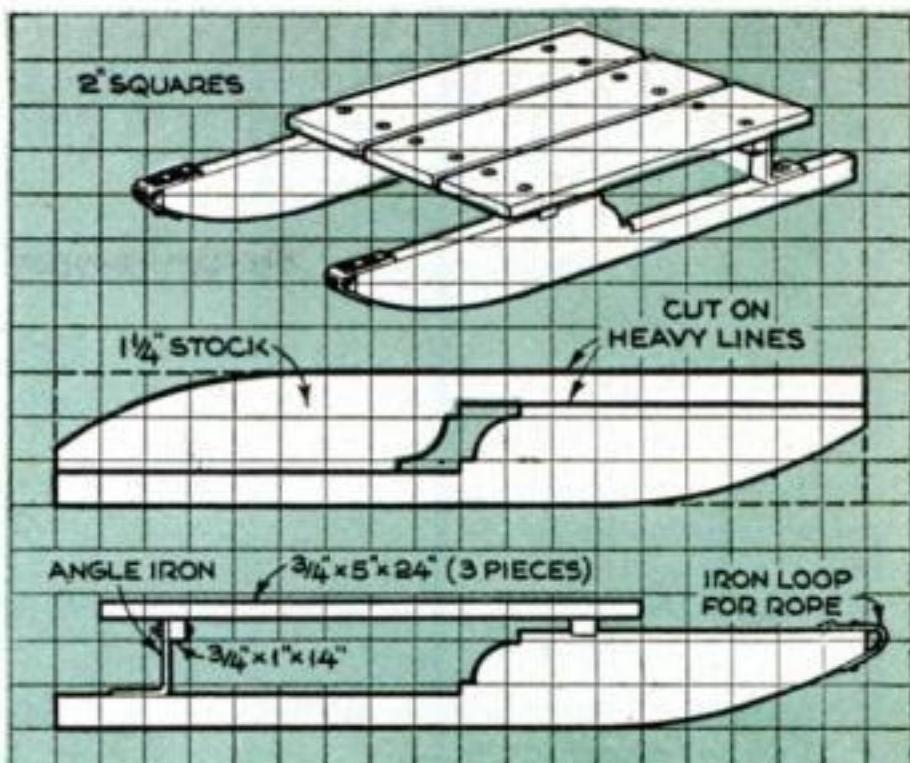
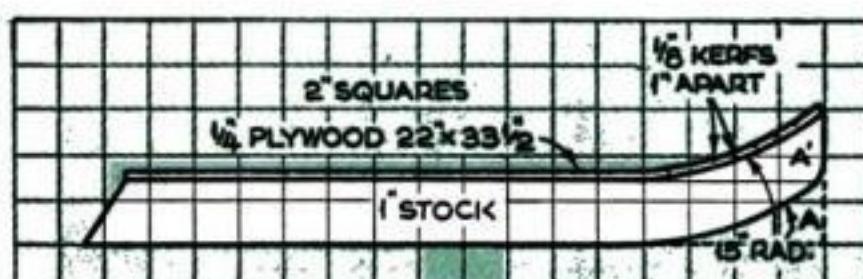
Herman Mintz of the Coast Guard served on one LST for 15 months. So it seems natural that he should have built this scale model of an LST. Asked what tools he used, he pulled out a razor blade, a carving knife, sandpaper, and a small drill. "That's the whole workshop," he grinned.



Sgt. John Cwihun made the table at left while convalescing at Halloran Hospital. Each turned upright was cut in three parts. The circular top and shelf were formed from plastic.

Ray Duckworth and Winston Bullard produced this chess set. All pieces and pawns are shells except the queens, which are Protex plugs used in aircraft engines during shipment.





Homemade Sleds for Young Children Are One-Evening Projects

Two sturdy sleds, designed for pulling by hand, are shown in the drawings. Either will carry a small child with little danger of tipping, and may also be useful for hauling groceries or firewood. A clothesbasket screwed to the deck will hold a baby safely, or a low seat with sides may be installed.

Resin-bonded plywood forms the deck of the sled at left, which was designed by G. T. Marris, of Brantford, Ont. It is curved by cutting kerfs in the front, brushing waterproof resin glue into them, and gluing and nailing to the runners. Triangular longitudinal cleats strengthen the joint between

runners and deck. These runners are cut from 1" by 3" stock with the waste, shown at A, glued and toenailed on as A'. Drilled and countersunk steel strips 36" long are held to the bottom of the runners with flat-head screws.

Runners for the other sled, designed by T. MacDonald, of Thornhill, Ont., are cut from 1 1/4" by 3" stock, as shown. Two angle irons hold the back crosspiece to them, and the deck is screwed on. For easy pulling, runners should be 1/2" to 3/4" further apart at the back instead of parallel.

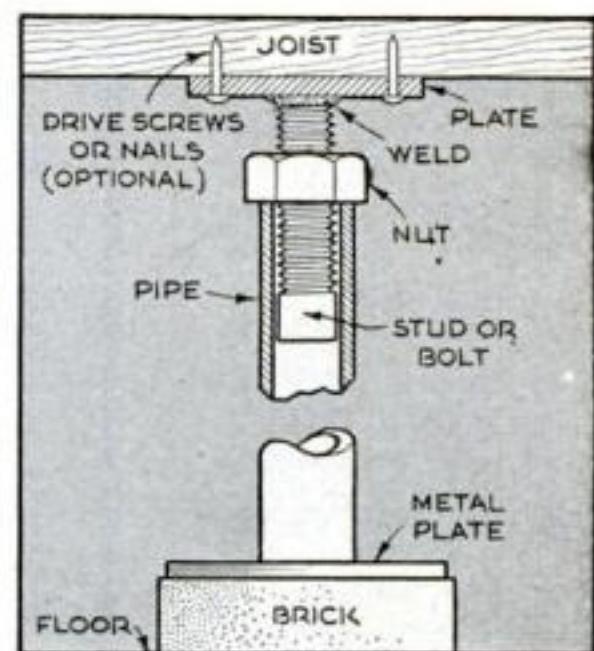
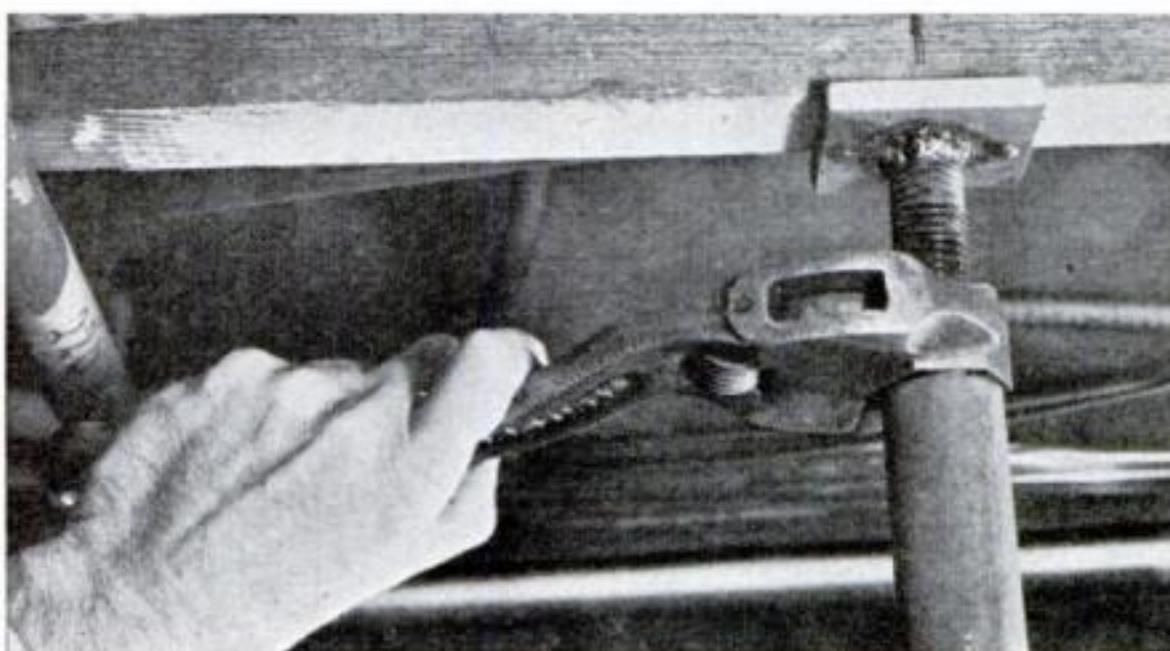
Finish with varnish and ski wax.

Adjustable Support Will Jack Sagging Joist Back into Position

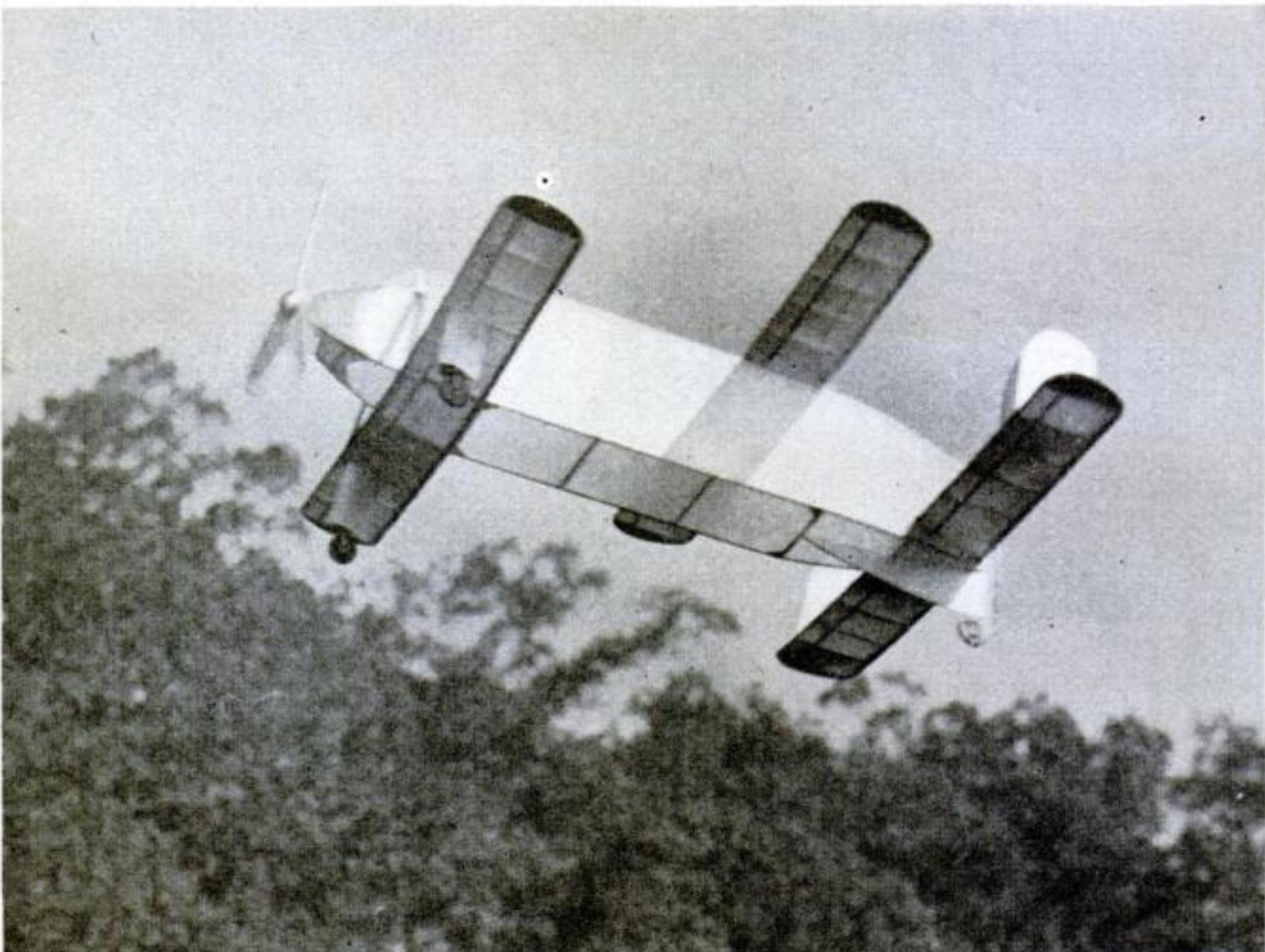
Badly sagging floor joists may be returned to level with an adjustable support that is left permanently in place. The support is assembled from a 7/8" or larger bolt or threaded stud several inches long, a nut, a piece of steel 3/8" or more thick and at least 2" square, and a length of pipe or steel tubing large enough to receive the bolt.

Weld the steel plate to the threaded end

of the bolt after the nut has been put on; then slip the other end (with the bolt head cut down if necessary) into the pipe. The latter should be just long enough to permit a brick or a concrete block to be put under it. Turn the nut to jack up the joist. To prevent damage to plaster, doors, or windows, jack the joist up gradually over a period of days or even weeks.—W. E. B.



FLYING CRATE . . . Air



Giant cargo planes resembling this experimental model some day may transport freight rapidly and cheaply.

AIR lines engaged in freight operations may rely on the conventional types of large aircraft for several years, but it seems probable that, as competition grows keener, the need for a more efficient cargo plane will become apparent. Four-engine planes now in use are sleek and impressive, but their cost of operation is high.

With a design dictated by utility, and having as its aim the consistent and inexpensive delivery of goods, the freight plane of the future undoubtedly will be a rugged work horse, not a graceful sky hurtler. Speed need not be tremendous, for a rate twice that of the fastest ground travel should be sufficient for a long time.

This plane must be capable, however, of working out of small fields. It must have doors large enough to accommodate anything which will fit into the cargo compartment. The design should be such that loading additional cargo will not necessitate rearrangement of the remainder in order to provide an even weight distribution and good flight trim. The latter feature would

reduce "station-stop" time to a minimum.

Just such a design is represented by the model presented here. This little job can lift truly surprising weights into the air R.O.G. (rising off the ground), and loading may be made at any point in the cargo compartment with equally good results. The middle wing slides fore or aft to trim ship. In a full-sized ship, the sliding wing could be actuated hydraulically by the pilot with the aid of instruments showing the weight distribution in the cargo compartment. Thus he could land a plane with a load of feather dusters up forward, toss a grand piano into the rear, read his dials, and set the wing for perfect flight trim while he was taxiing out for the take-off.

Standard controls, ailerons on the front wings and rudders and elevators on the rear, would be used. Twin engines, mounted in the nose and tail, would provide plenty of power for the take-off. Once cruising altitude was reached the rear engine could be stopped, the propeller feathered, and the flight carried out with great fuel economy.

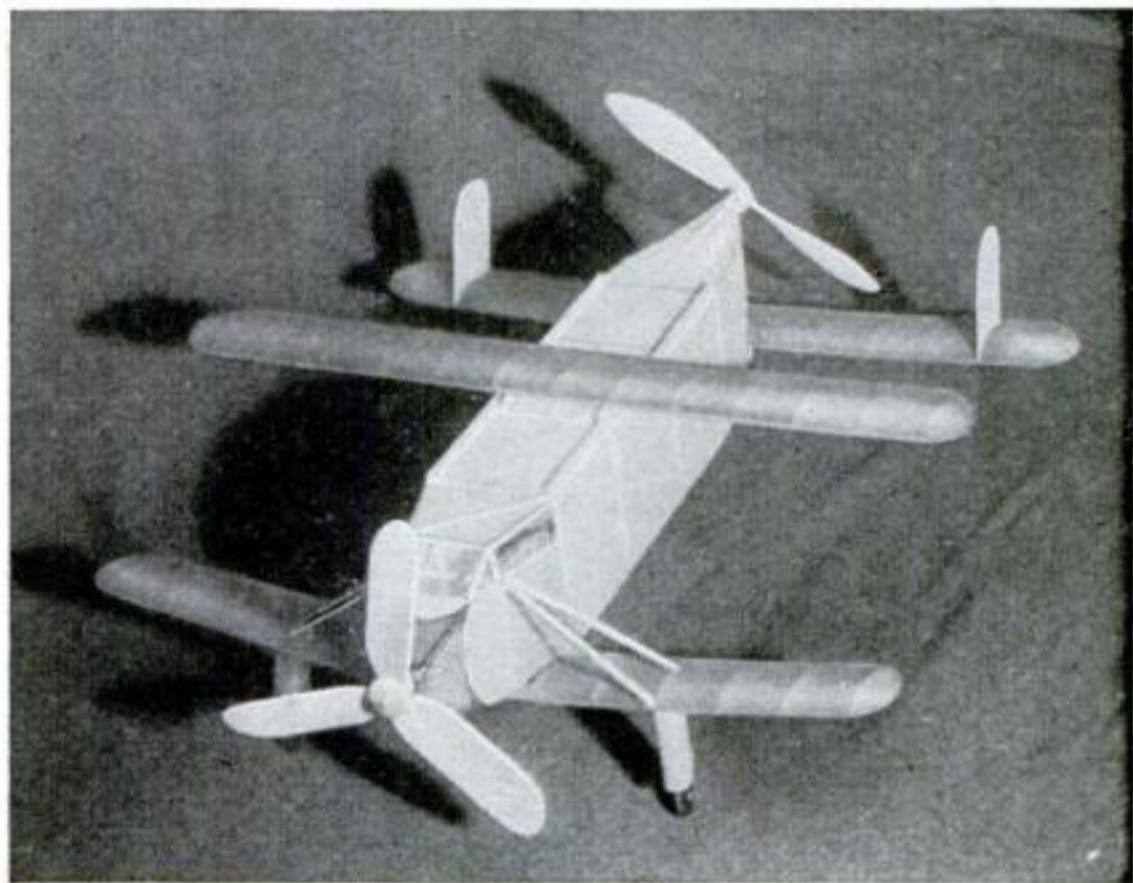
Freighter of the Future?

By ROY L. CLOUGH, JR.

In the model, two propellers rotating in opposite directions provide a powerful torque-free thrust, permitting the use of far less dihedral and giving greatly increased lifting ability for the wing area.

Construction is simple and conventional. For the fuselage use $\frac{1}{8}$ " square medium balsa strip. It may be necessary to soak the lower longerons in hot water for several minutes to get the proper curve near the nose. Gusset plates permit the omission of diagonals, so be sure to put them in. The forward part of the nose section is covered with $\frac{1}{16}$ " sheet, as shown on the plan. A cargo door is placed on the right side only. Notice that this opens providing a ramp for easy loading of cargo.

After the fuselage has been covered in the customary manner, rails are installed atop each upper edge for adjustment of the middle wing back and forth. Make each rail of two pieces of hard balsa, one $\frac{3}{32}$ " square and another $\frac{3}{32}$ " by $\frac{1}{4}$ ", gluing the square member atop the fuselage and the second on this so as to provide an inner overhang.



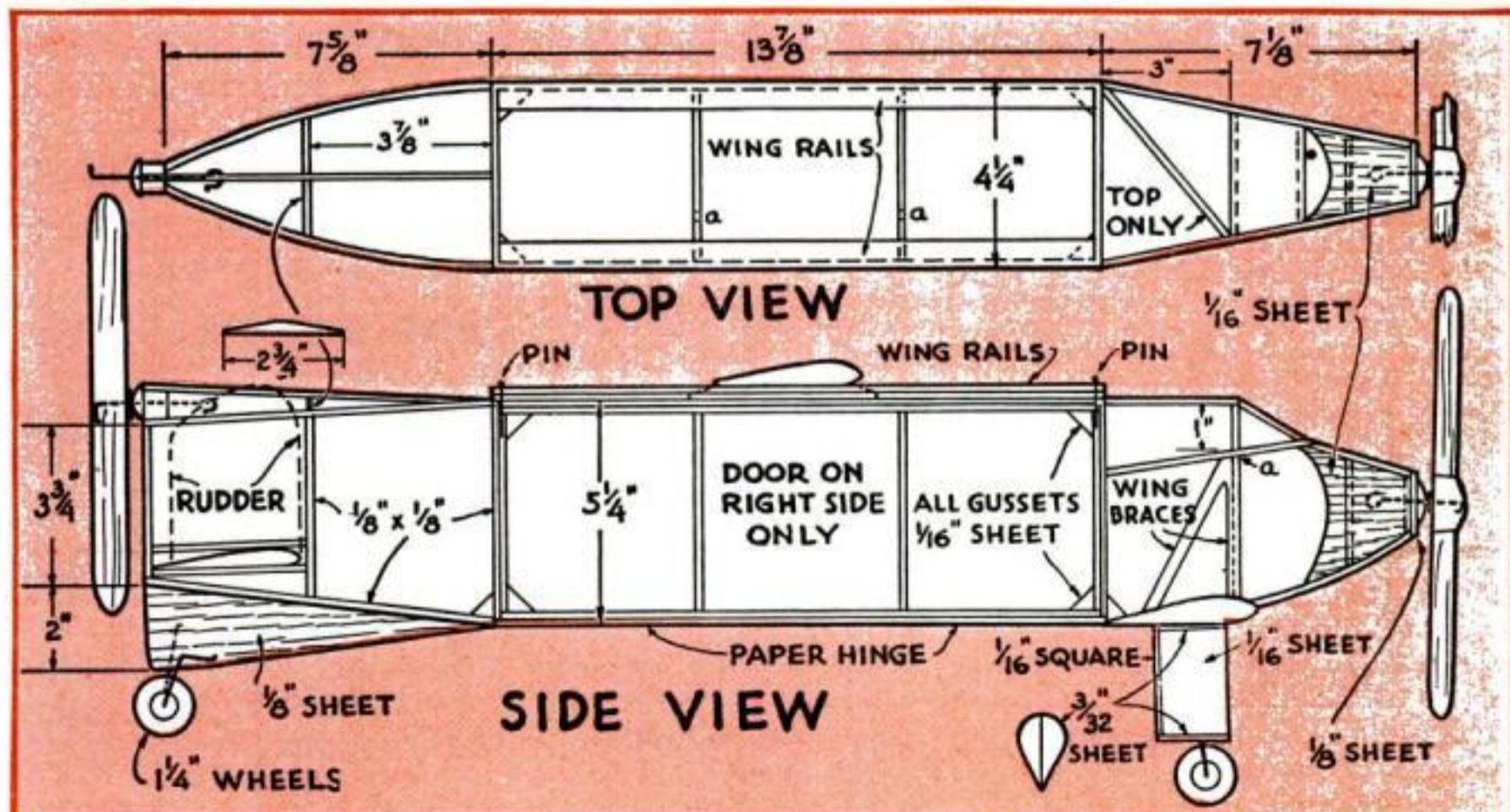
Adjustable fore and aft, the middle wing compensates for weight distribution of the cargo and keeps the plane in good flying trim.

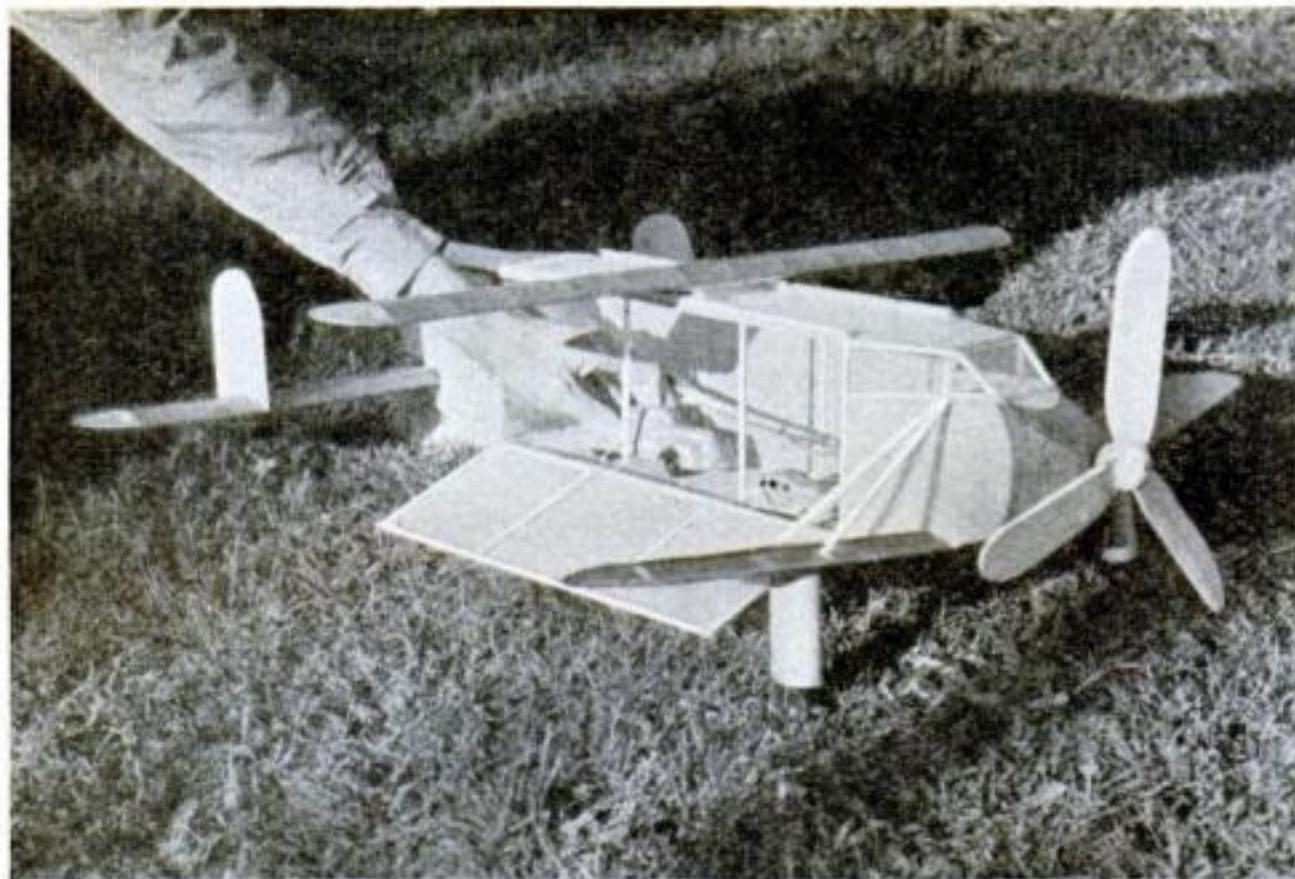
downward,

How runners, also made of $\frac{3}{32}$ " hard balsa, are cemented to the wing is shown in the plan on page 172. There should be enough friction between the rails and the runners to hold the wing in any position it is set without the use of rubber bands.

One basic plan covers all three wings, but there are some slight variations in each. Although 38 ribs were used in the wings of the model shown in the photographs, it

Conventional methods are followed in building the model. Note that pins hold the door shut during flight.





Fully wound, the freighter will take aloft a cargo of light plastic toys.

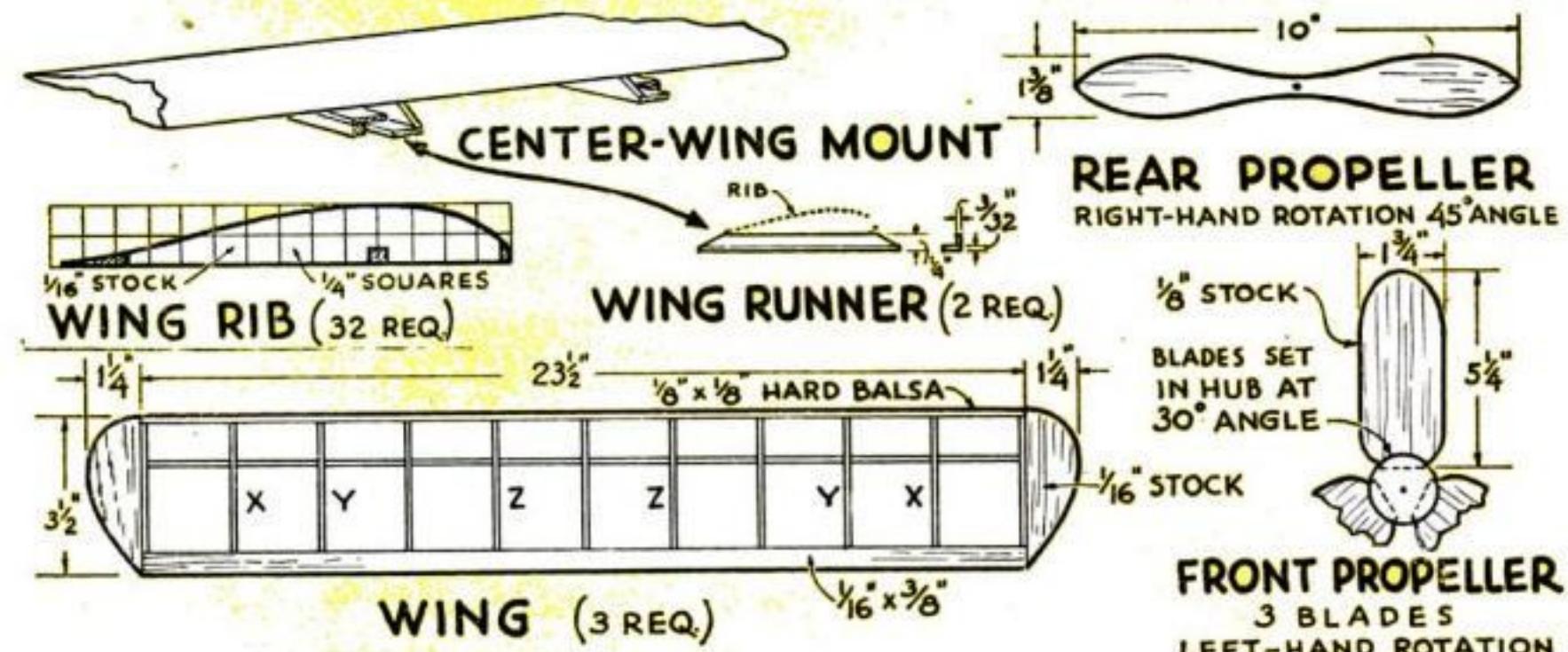
is possible to do the job with only 32, as indicated by the plan.

Since the fuselage sets into the front wing, the center rib is omitted in this case, but the pair marked Z are slanted slightly so as to give a good fit against the lower longerons. The underside of this wing is covered with $1/20"$ sheet balsa to the wheel strut positions at the ribs marked Y. Wing braces also are attached to these ribs, the third from the fuselage. Give this front wing a dihedral of $1\frac{1}{2}"$ under each tip.

In placing the front wing, make certain that there is sufficient clearance for the cargo door to swing down.

The middle wing is without dihedral. Its center between the ribs marked Z is covered with $1/20"$ sheet balsa on the underside, and the runners are attached to this.

One general plan serves for all three wings. Friction will hold the center wing in place on the runners.



Mounted in a slot through the fuselage, the rear wing has just a slight dihedral, provided by steaming after covering. Note that the rudders are attached to the rear wing at the ribs marked X.

A few minutes devoted to making the wheels spin freely and track evenly will be time well spent, for ease of movement is important here in any R.O.G. weight-lifting tests conducted with the model.

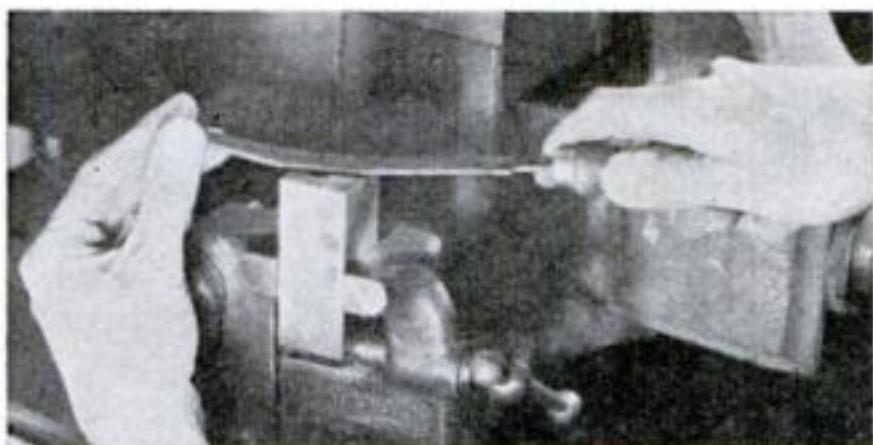
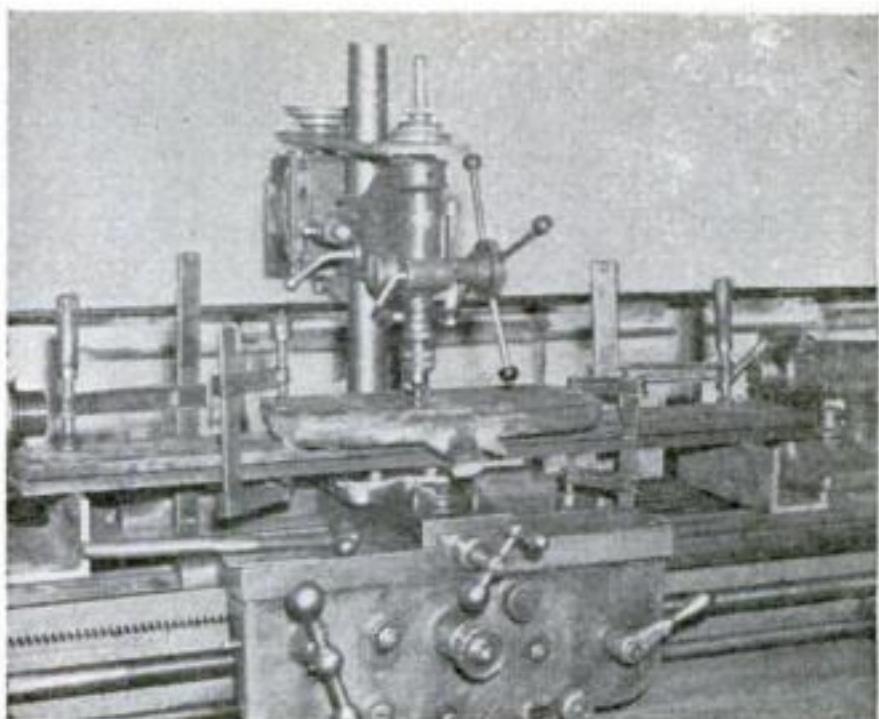
Notice that the two propellers are angled for opposite rotation,

the three-bladed front one for left-hand operation and the two-bladed rear one for right. Rubber strands comprising the motor are stretched from one propeller hook to the other. If you are flying the plane alone, winding can be accomplished by standing the model on end against the ground and turning the front propeller by hand. If a winder is used, an assistant should hold the rear prop.

Before trusting the model to areas where it might become damaged, test it carefully over long grass until you have become familiar with its flight characteristics and learn the proper wing settings for various loadings. When flying R.O.G. with cargo aboard, make certain that the latter is securely fastened down, for a galloping center-of-gravity might wreck the model.

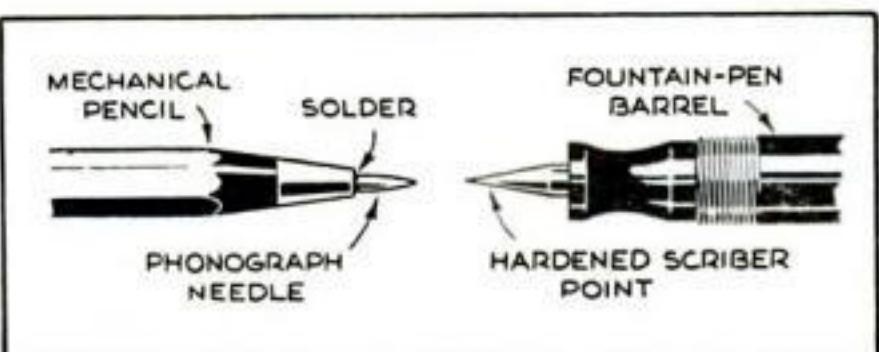
NEW SHOP IDEAS

VERTICAL MILLING in the lathe can be done in an emergency with the aid of a small drill press. In the setup shown, the base of the drill press was bolted to the carriage of a large lathe, two angle irons were cut to rest across the bed inside the ways, a long reinforced plate was clamped to both the bed and angle irons as a table, and a milling cutter was used in the drill chuck. James W. Kemp, of Santa Fe, N. Mex., improvised the machine for milling old-style cylinder heads to provide valve clearance when used on 1945 Fords.

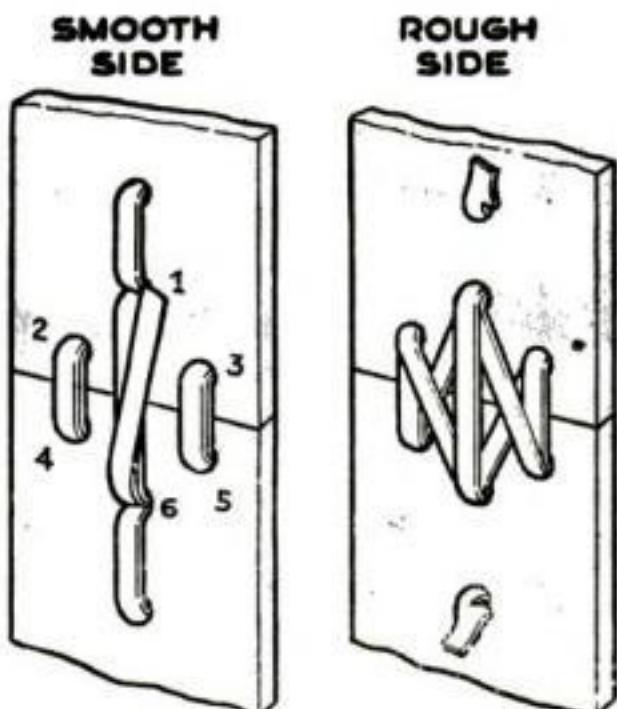


CURVED FILES are sometimes useful for filing a flat surface where a straight file is likely to remove more stock at the edges than in the center. An ordinary flat file can be so curved by heating it to redness and bending it in a vise or with a soft hammer. It then should be rehardened by heating to a cherry red and plunging into water, or into quenching oil for less brittleness.—W. E. B.

OLD PHONOGRAPH NEEDLES are excellent for precision scribing on delicate work when fitted with a suitable holder. One can be made from a discarded mechanical pencil, the opening being drilled out if necessary for the needle to go in. A little solder sweated into the joint will hold the needle firmly. Fitted into the pen-nib hole of a fountain-pen barrel, a turned and hardened steel point also makes a good scriber. Used with the cap, it can be carried in a pocket.—GUTHRIE B. STONE.



BELT SPLICING



[SHOP PRACTICE]

Measure the length of belt needed with a steel tape or strong cord over the pulleys, and lay the tape or cord on the belt straightened out on the floor. Mark the belt with a square and cut the ends evenly. Punch at least three rows of holes parallel to the edge, just large enough for the rawhide lacing, and not too close to the edges of the belt. Three rows are sufficient for a 3" belt, five for a 5" belt, and so on.

Start lacing from the smooth or pulley side to the rough or topside of the belt, crossing the lace on the rough side. The South Bend Lathe Works, in its booklet **How to Run a Lathe**, recommends that lacing start at the holes 1 and 6, with the lace pulled tight and the ends evened up. Then lace alternately in the following order:

6 to 2, and 1 to 5; 5 to 3, and 2 to 4;
4 to 2, and 3 to 5; 5 to 3, and 2 to 4;
4 to 1 and out; 3 to 6, 6 to 1, 1 to 6, and out.

If gut is used instead of rawhide, the ends may be brought back through 1 and 6 respectively and then back out through the outside holes, after which they may be tucked under instead of being notched as shown.

WHEN YOU'RE CORNERED...

Shaped from Odds and Ends, These Handy Little Tools in Delicate Work, and Often Get You Out of a Tight

By WALTER E. BURTON

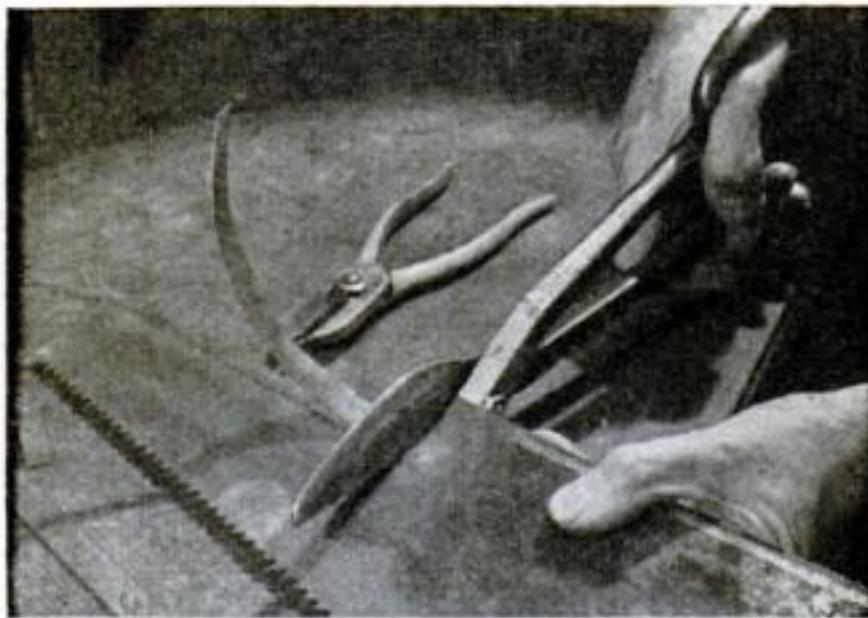
DICKING up tiny parts and holding them in place for assembly can be a fumbling task at which your fingers prove all thumbs. Or you can use tweezers. Try putting an 0-80 bolt in a model-railway locomotive, and you will see that these little pincerlike implements have a definite place in the shop as well as in the medicine cabinet or on milady's dressing table.

There are, in fact, many different kinds of tweezers that are never seen in a bathroom or boudoir. Some stores carry special tweezers designed for use in making or mending jewelry, model building, watch and

clock repair, and other craftwork where delicate parts are handled or assemblies require working in tight corners.

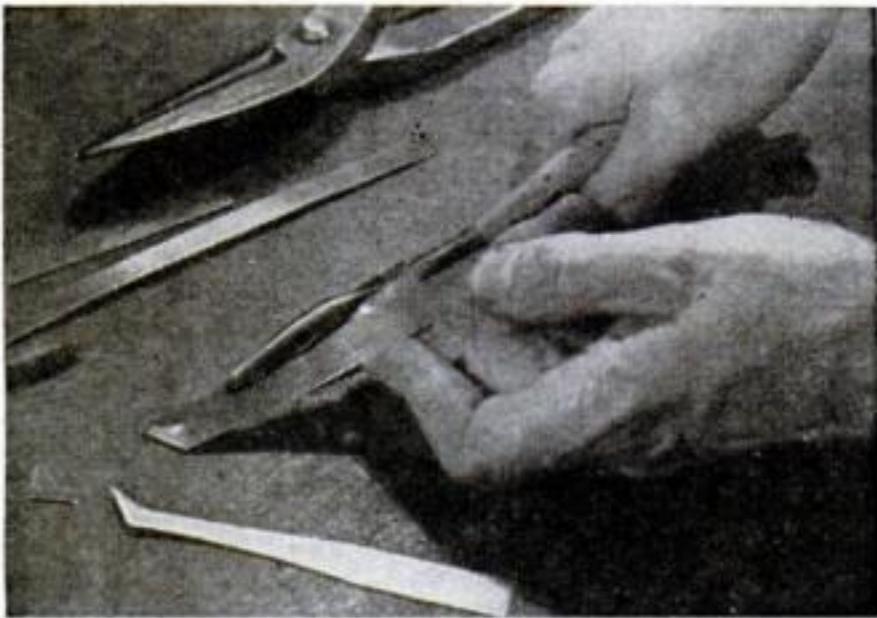
You can make your own tweezers to fit your exact needs from castoff hacksaw blades or bits of strong, springy wire. A worn-out hand saw will provide material for a dozen pairs. And if you should ram a splinter into a finger—why, you can remove it without leaving your bench.

The photographs on this and the facing page illustrate the steps in making a pair of tweezers having offset tips. They are a variation on normally open, plain tweezers—the ordinary garden variety, most numerous and probably most useful for all-around



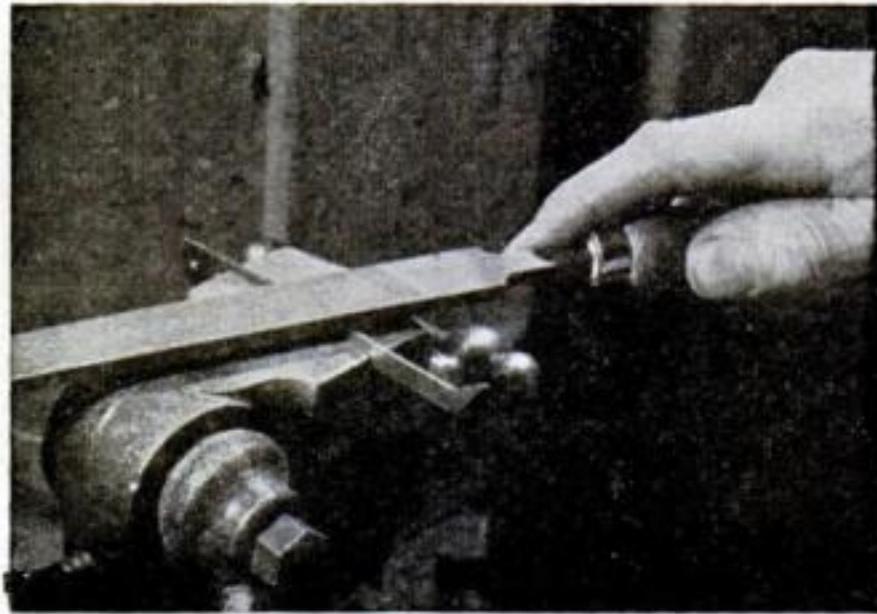
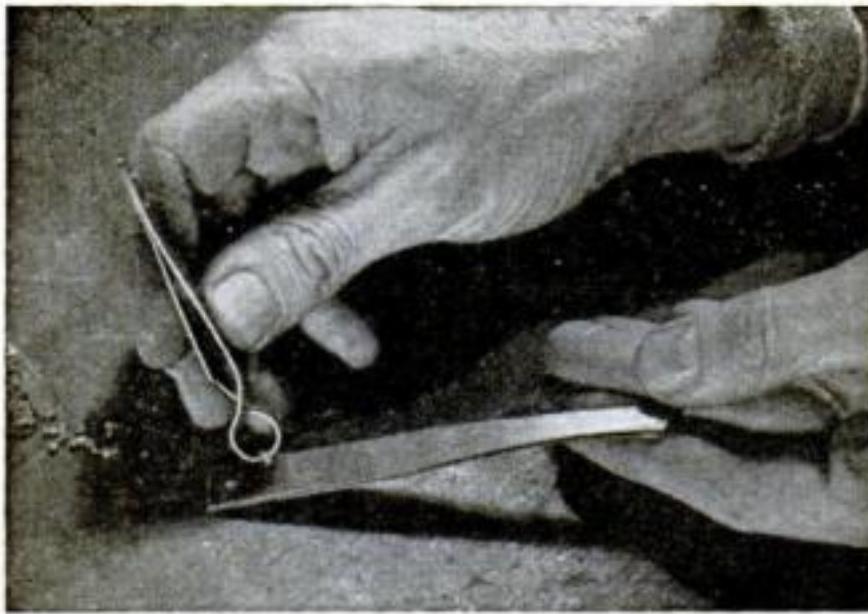
1 Stock for a dozen different kinds of tweezers can be had from an old handsaw blade. Soften a section by annealing and cut it with tin snips.

3 Holes are drilled and rivets put in (but not peened over in this step) to align the blades for final shaping. Note the claw tweezers in use.



2 Strips of the blade steel are trimmed roughly to shape with snips. The tweezers shown will have offset points good for use in close corners.

4 The aligned sections are clamped in the vise and filed to almost final shape. Dressing of the tips is left until the rivets have been set.



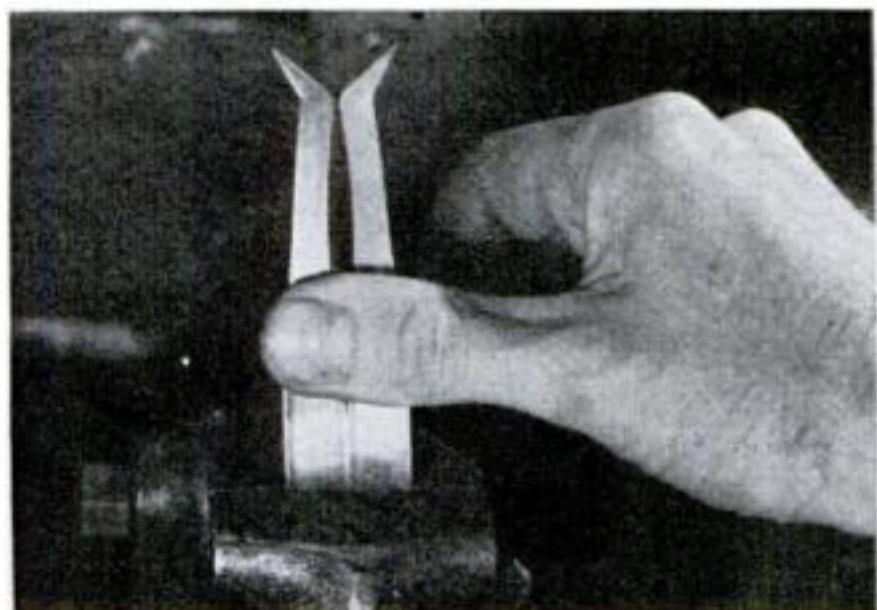
TRY TWEEZERS

Serve as Extra Fingers Spot by Getting into It

work. Such normally open tweezers can be provided with a locking device that will hold them in the closed position.

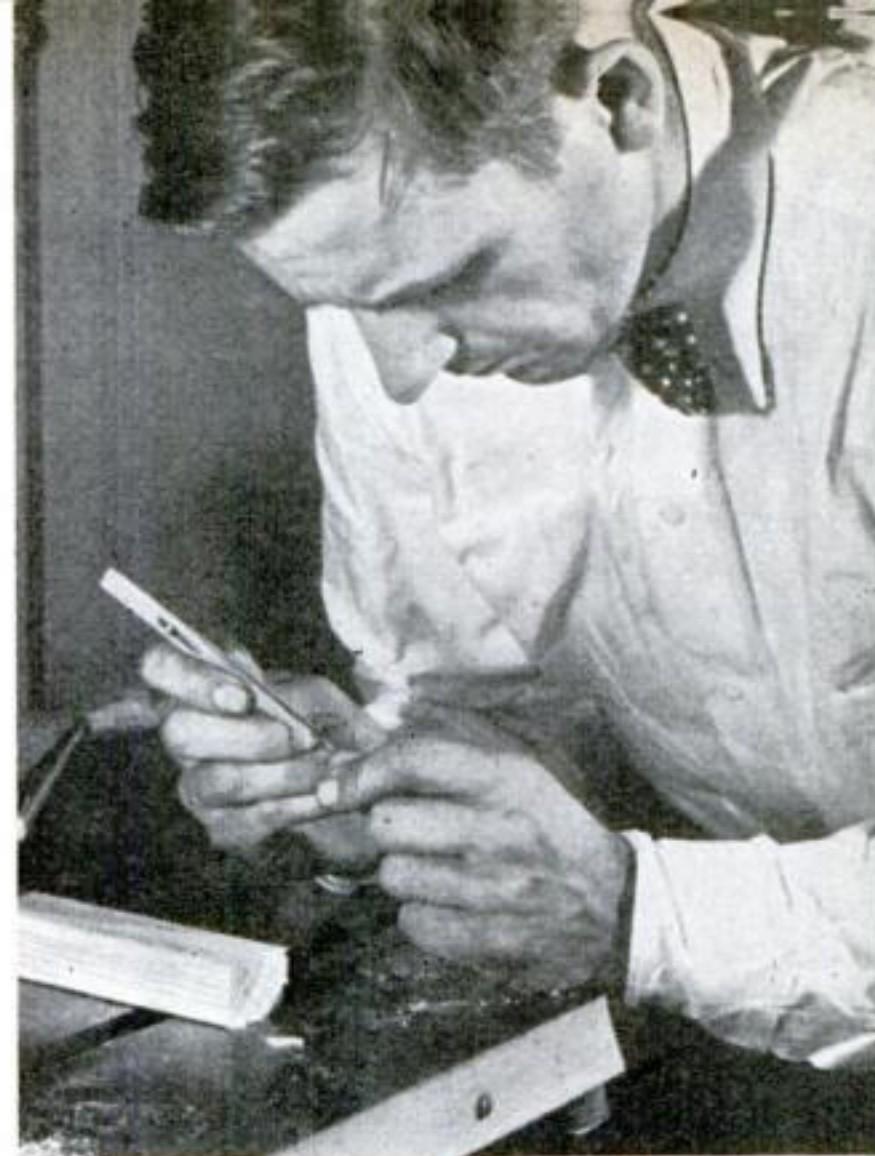
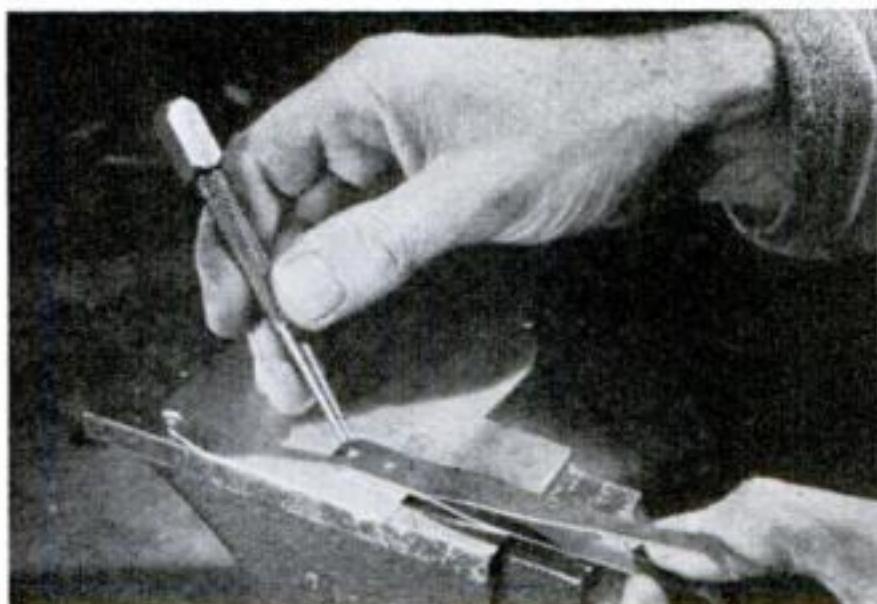
Another type is a normally closed pair with tips that remain pressed together until separated by finger pressure—a kind of spring clamp often used for clamping together small parts that are to be glued or soldered. And there are many other possible variations in tweezer design, including size, stiffness of spring action, and shape or position of the tip. Any of those shown can easily be made in an hour or so.

If a saw blade is used, select one that is hard all over, not the kind with a soft body and a hardened tooth strip, for the tweezers



5 The tweezers are to be the normally open kind. To give them springiness, the blades are separated, held in a vise, and then bent back slightly.

7 With the rivets reinserted, a large nail set is used to peen them permanently in place. A sheet of soft metal prevents marring of the heads.



Removing splinters or holding tiny parts, tweezers are needed in a pinch. These have needle points.



6 The inner surfaces of the tips are milled by striking a file with a plastic hammer. Only the portion being milled is supported on the anvil.

8 When the finished shape has been worked with a file and abrasive cloth, the tips are heated to redness and quenched in oil to reharden them.



must have enough strength to be springy. Sheet monel metal, stainless steel, bronze, beryllium copper, and springy brass are metals that are suitable when rust and corrosion must be avoided.

A portion of a discarded saw blade, large enough to provide strips for the legs, was annealed to make the offset-point flat tweezers shown. Many kinds of alloy steels are used for these blades and for hacksaw blades, but most of them can be softened sufficiently by heating to redness and cooling in air. If this fails, try burying the heated stock in ashes or lime to reduce the cooling rate.

You should be able to cut out the strips with ordinary tin snips, as in Fig. 1. The going may be hard at times because these blades usually retain some toughness. Shape the legs roughly with snips (Fig. 2), align and drill them, and hold them in alignment with two rivets slipped in (Fig. 3) but not peened yet for permanent assembly.

Clamp the aligned parts in a vise and file them together to almost the finished shape, as shown in Fig. 4. Then remove the rivets, separate the legs, clamp them as in Fig. 5, and bend them so their tips will be $\frac{1}{2}$ " or so apart when they are reassembled. Next, support only the tips on an anvil or block, one at a time, and roughen them on the inside with the milled edge of a flat file struck a good blow with a plastic hammer, as shown in Fig. 6, to drive the teeth into

the metal. Needle-pointed tweezers are usually left smooth on the inside, but those used for picking up small screws and the like work better when roughened.

The rivets are then reinstalled and peened down tightly, as in Fig. 7. A large nail set will round them nicely, and the heads should rest on aluminum, lead, or other soft metal so they won't be flattened. Final shaping, dressing, and deburring with file and abrasive cloth complete the job except for rehardening the tips. This is done by heating to redness and quenching in oil, as shown in Fig. 8. Be careful not to overheat the ends. If you have no quenching oil, try a 50-50 mixture of linseed and motor oil. Polish off the oxide scale, and your tweezers are ready for use.

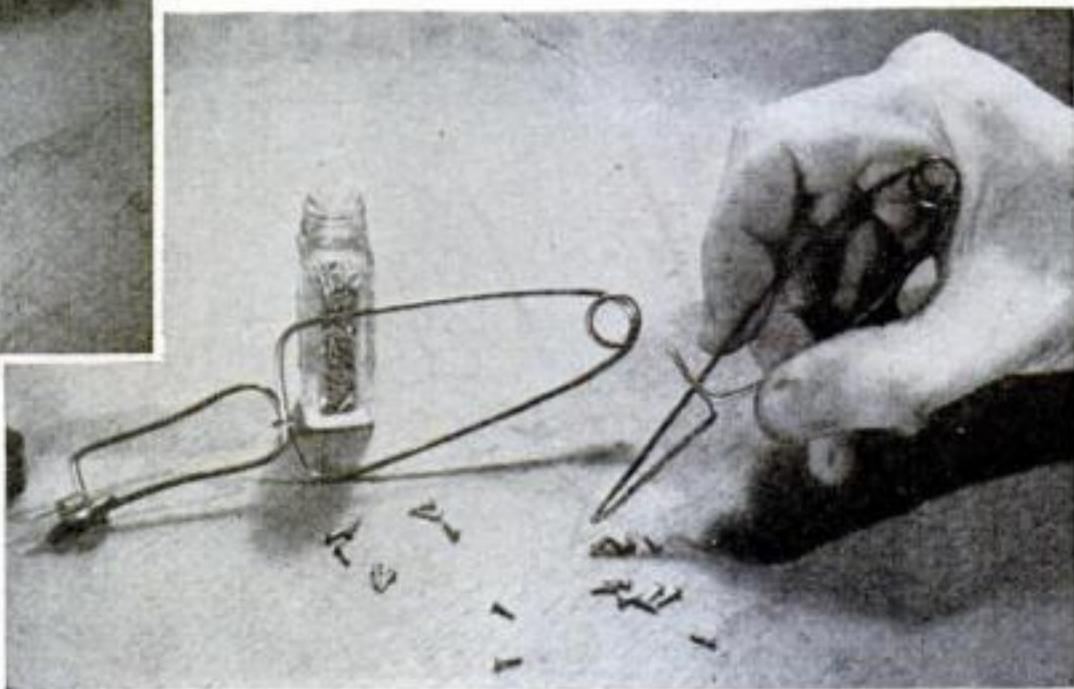
Normally closed claw tweezers are shown in the photos and drawing on the facing page. The two halves are exact duplicates cut from flat stock and notched as indicated. Maximum movement of the jaws is determined by the length of the notches and the angle at which the sections are bent where they cross. Bend the tips to a semi-circular shape by hammering them around a steel rod.

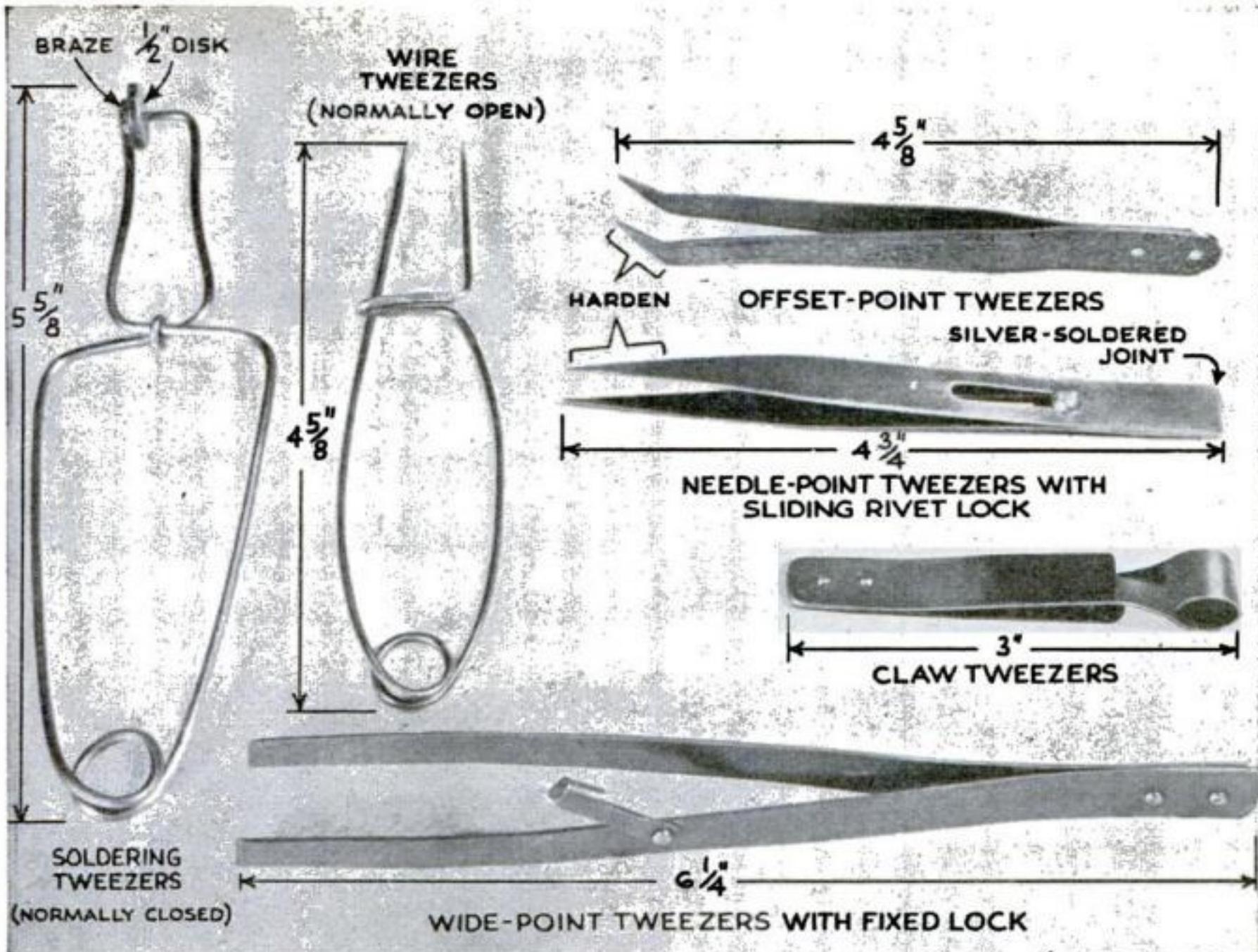
The little 3" claw tweezers illustrated have a great many uses, one of which, gripping small rivets just below the head, is shown in Fig. 3. Builders of model airplanes will find them handy gluing clamps. They may be made in any convenient size.

Tweezers that are normally open may be provided with various kinds of locks to hold them closed on a part being gripped. A sliding-rivet lock is shown on the needle-pointed tweezers in two of the photos, and a hinged-hook lock is shown in one photo. Slot both legs of the tweezers for the sliding rivet by drilling holes to form the ends and removing the intervening metal with a jeweler's saw. Or you can drill a series of holes and file out the slot. The hinged hook is bent from flat stock so it can be moved over the



Three varieties of tweezers are shown here. Above, holding a camera-shutter screw, are needle-point tweezers with a sliding-rivet lock. Both pairs at right are made of springy wire. Those being held are brass, and the others, soldering tweezers, are of piano wire.





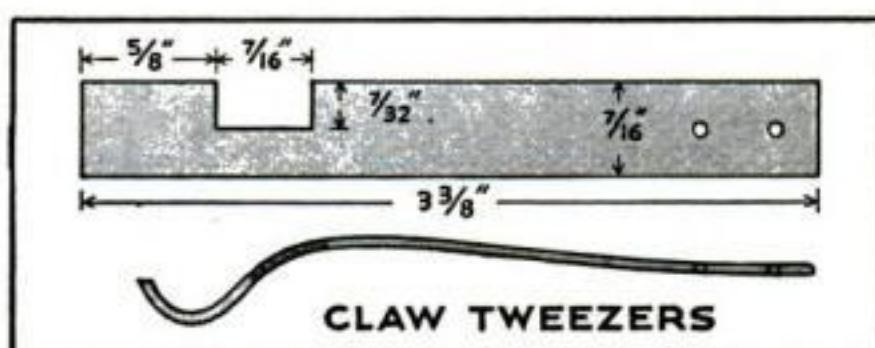
Here are over-all dimensions for a set of small tweezers that will find many uses in the shop. All are homemade of scraps of salvaged metal. The flat pair at bottom is provided with a hinged locking hook.

two blades to hold them together. When not needed, it is swung over one blade.

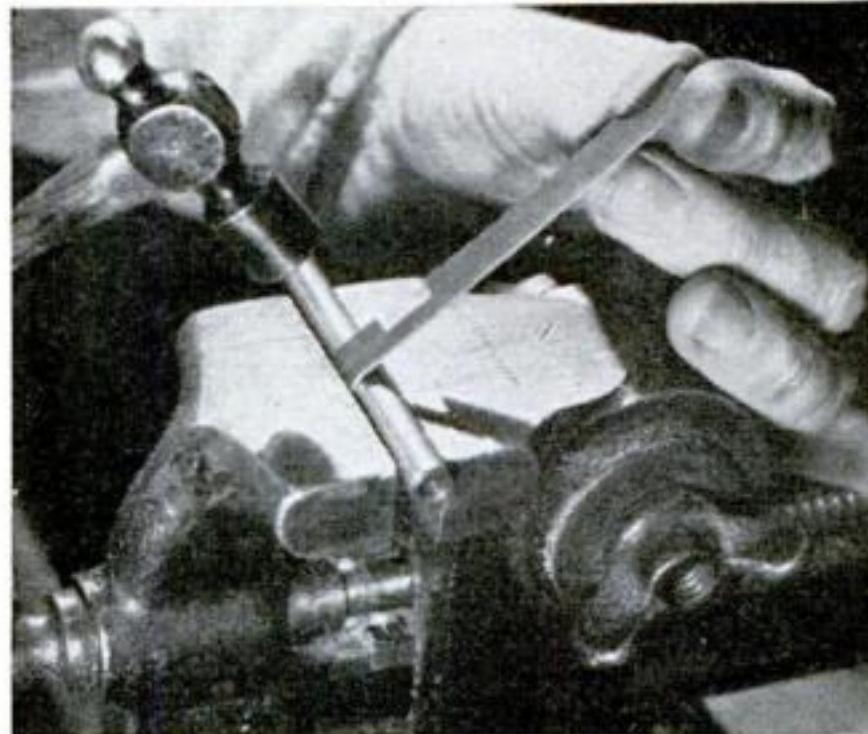
By far the simplest tweezers to make are bent from springy brass or steel wire. Piano wire is excellent for the purpose. The two shown above and on the facing page are each bent from a single piece of wire. A loop on one leg acts as a guide for the other leg to assure meeting of the points, or a small ring will serve the same purpose. The pair at the left in the photos has normally closed jaws consisting of brazed-on brass disks and is intended primarily for use as a clamp to hold small parts being soldered.

By providing other kinds of jaws, you can adapt the soldering-type wire tweezers to various kinds of clamping work. Jaws made of two ring-shaped loops coming together flatwise are useful for holding fairly large work for soldering or while glue sets. Straight jaws flattened at the ends are suitable for such delicate work as soldering jewelry. And still another type has two squared-end jaws bent to meet endwise.

Many other variations of both flat and wire tweezers are possible. With the designs shown here as a start, you can construct any type your hobby might require.



Claw tweezers are made with two identical notched legs rounded on the end in a vise as shown below.



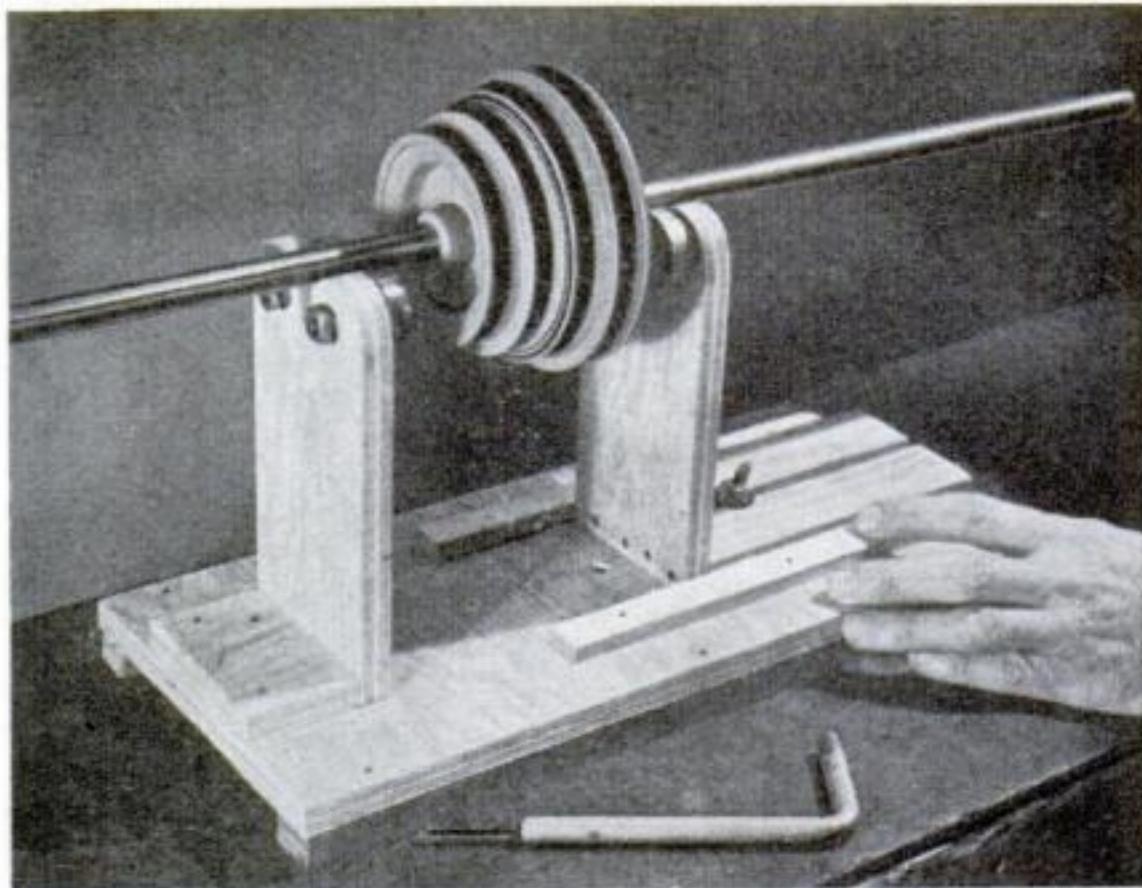
Ball-Bearing Tester Checks Bent Shafts

FOUR ball bearings, five bolts with nuts and washers, and some scrap lumber will provide you with a tester to try the trueness of electric-motor shafts and similar parts. With no more equipment you can also check pulley wheels, armatures, and the like for rough static balancing. The addition of a knife-edge rim to each bearing will increase by a good deal the sensitivity of the static-balance test.

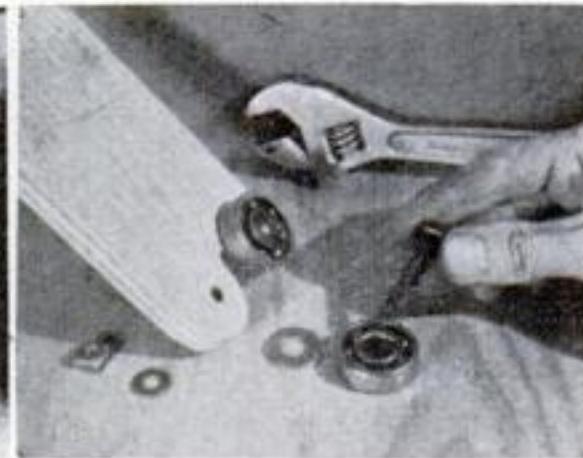
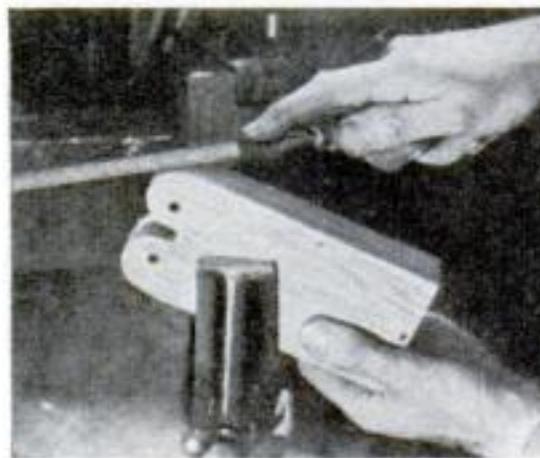
Ball bearings of the sealed type are preferable. They must be free running, so use very light oil when you lubricate them. Mount them on two uprights, as shown, spacing each pair so their faces will not quite touch. The bearings in the photos are $1\frac{1}{4}$ " in diameter and have a $\frac{3}{8}$ " face and $\frac{1}{2}$ " hole. If you use $\frac{1}{4}$ " mounting bolts, they will allow for lateral adjustment. A washer between each bearing and the wood will permit enough clearance for free rotation.

The uprights shown are $\frac{1}{2}$ " by 3" by $6\frac{1}{4}$ " plywood. One is mounted permanently on a $6\frac{1}{2}$ " by 14" base. The other is attached to a $\frac{1}{2}$ " by 3" by 6" strip slotted $5/16$ " for most of its length and sliding between two guide strips. A $\frac{1}{4}$ " bolt and wing nut lock it in place.

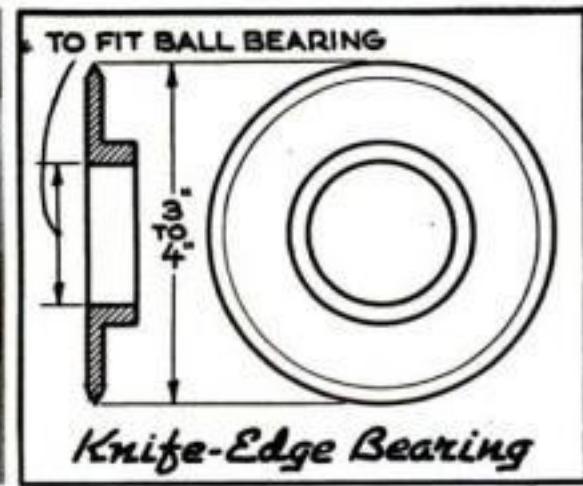
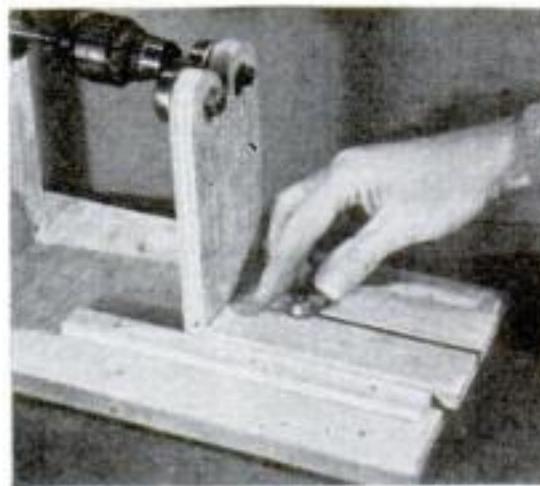
For sensitive static balancing, make the knife-edge rims as indicated in the drawing, using steel that can be hardened. The holes should be in the exact center and a press fit for the bearings, which will have to be respaced to suit the rims.—W. E. B.



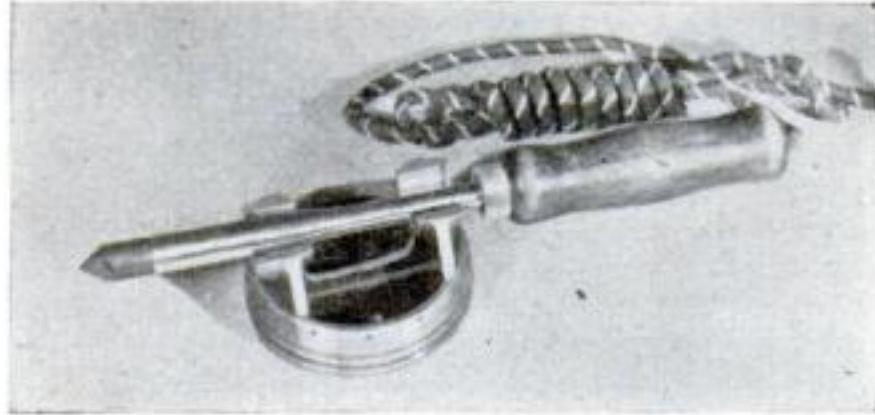
Rotated while its shaft rests on two pairs of ball bearings, an armature, pulley, or the like can be tested quickly for trueness.



The two $\frac{1}{2}$ " plywood uprights are temporarily fastened and finished as one piece. Bearings are held to them with $\frac{1}{4}$ " carriage bolts.



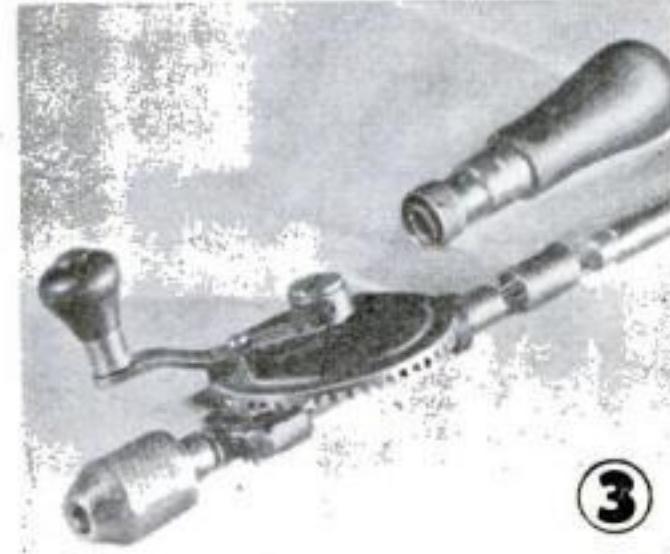
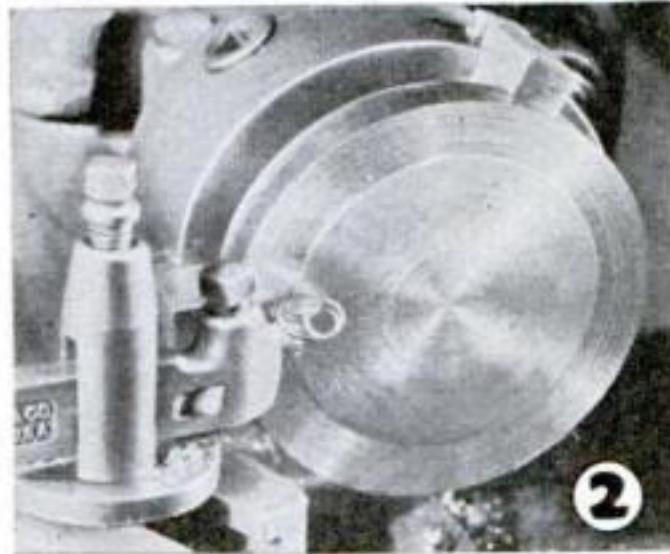
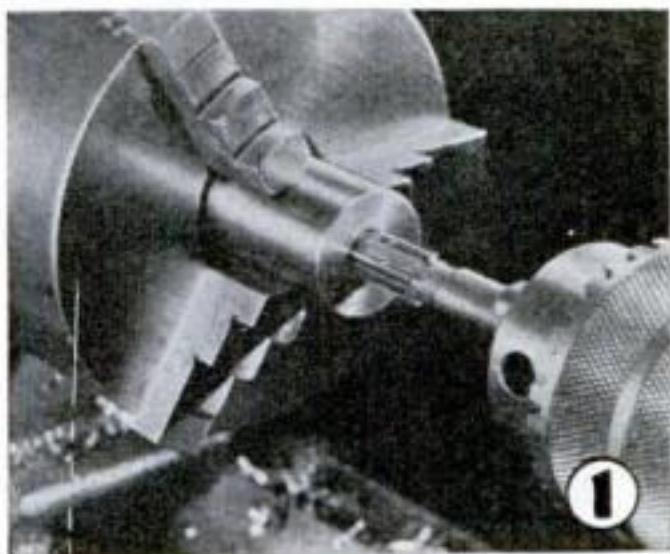
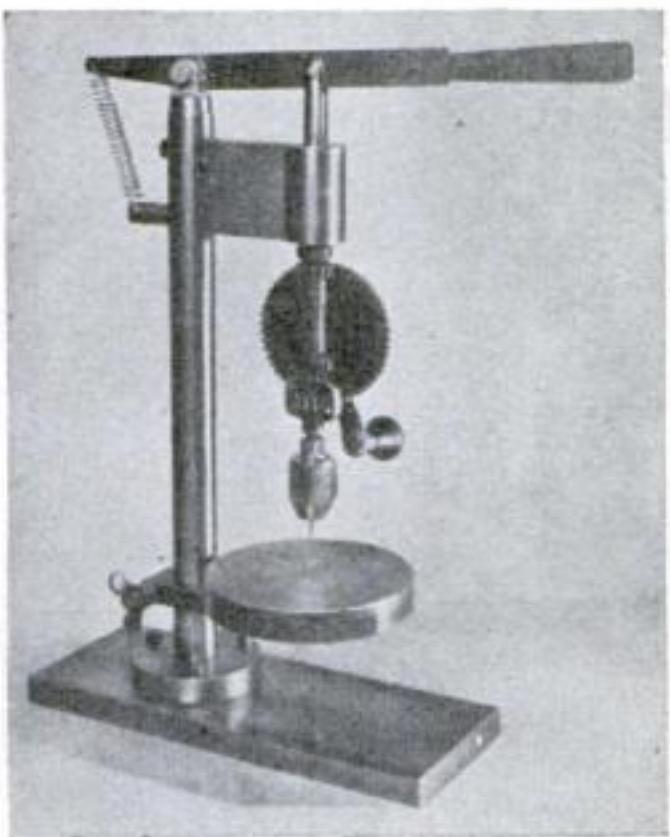
One upright is adjustable in a slot for different shaft lengths. The drawing shows a knife-edge bearing to help static balancing.



Piston Cradles Soldering Iron

SAWED through the wrist-pin bearings, a discarded auto piston will hold a hot soldering iron safely off the bench. If desired, the skirt may be cut away, leaving only the piston head for the base and the bearings for the rest.—C. W. W.

HAND-POWERED DRILL PRESS



OLDING a hand drill steady at a true 90-deg. angle to the work is next to impossible. But with a small drill-press frame and table built to fit the hand drill used, you have the equivalent of a small sensitive drill in precision. Drill breakage is less likely with such a setup. The hand drill is firmly supported and fed to the clamped work with one hand while the other hand turns the crank. A $\frac{1}{8}$ " hole can be drilled through the inside of the chuck and into the lower end of the spindle so that small drills can be chucked close to the point.

Cut the main column to length, face the ends smooth, and drill and tap the top to receive the forked lever bracket, which is made up separately. Then turn the heavy collar, bore it for a shrink fit, drill for mounting screws, heat it, and drive it permanently on the lower end of the column. Drill and ream the spindle guide also in the lathe. Turn the end of the spindle a drive fit in the bushing, which also fits tightly on the upper stub of the hand drill.

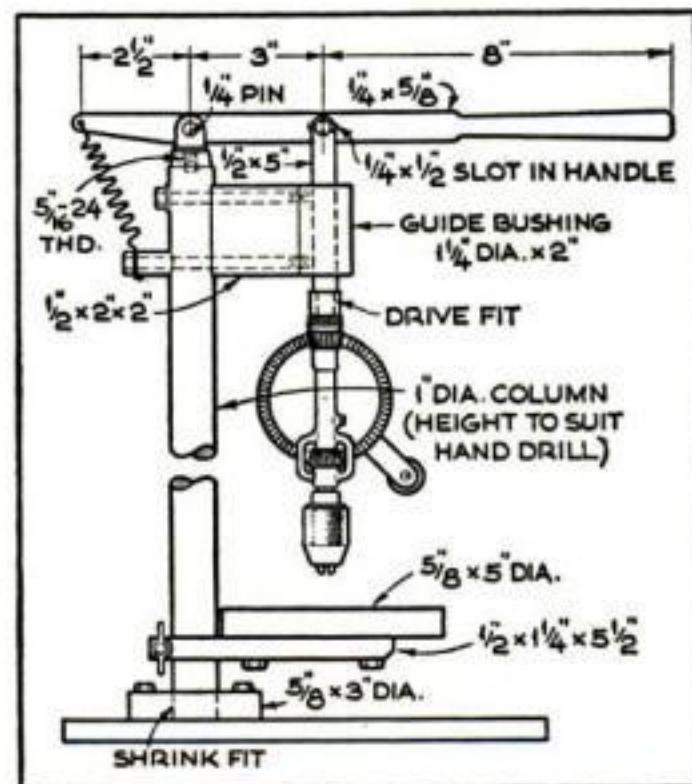
Make the table bracket by boring the hole for the column in one end of a flat piece of steel held in the four-jaw chuck. Cross-drill for the thumbscrew, opening to clearance size halfway and tapping the rest, and split the end with a hacksaw to give clamping action. Holes for two mounting screws are drilled in the table and bracket at the same time. Drill the column for two screws that pass through the spindle bracket and hold the guide bushing.—C. W. WOODSON.

1 With the spindle guide chucked in the lathe, drill and ream to a sliding fit.

2 A steel disk is faced smooth for the table and drilled for mounting screws.

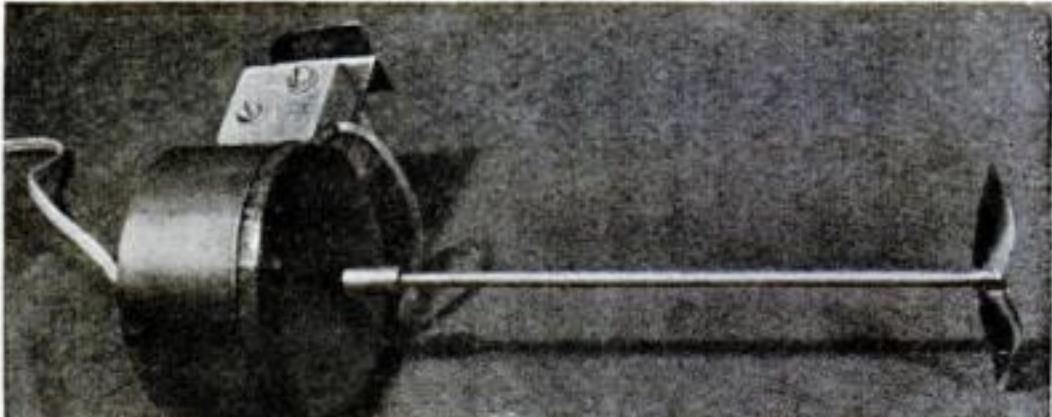
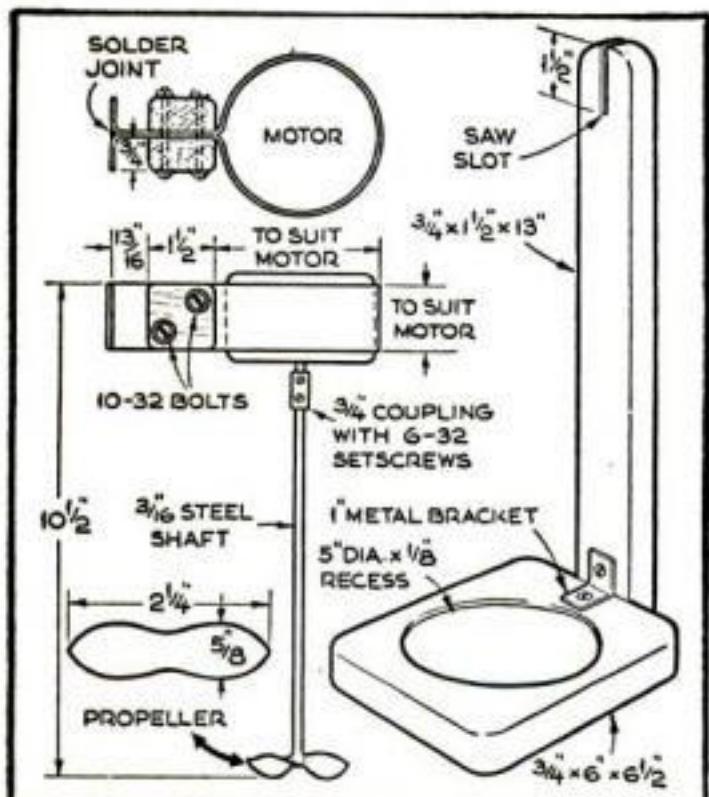
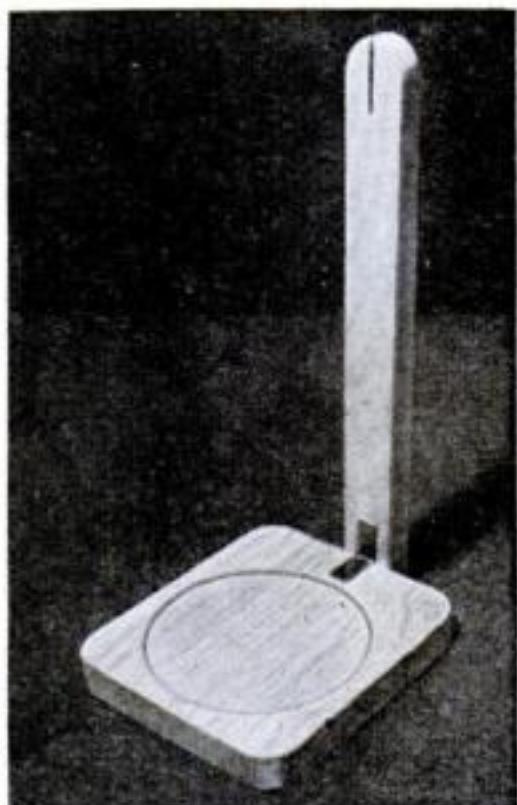
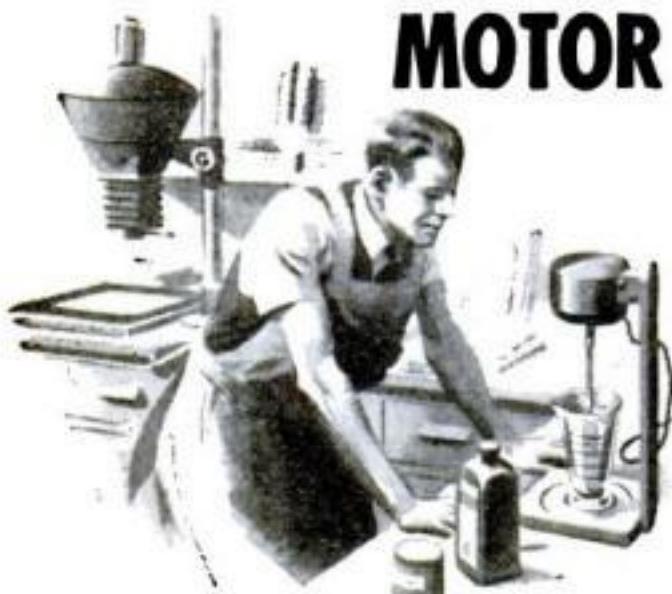
3 Spindle and drill are put together with a bushing. Turn both to a drive fit.

4 Here the bracket is on the table. The column and other parts are also shown.



4

MOTOR MIXER FOR PHOTO SOLUTIONS



By WILL THOMAS

PHOTOGRAPHERS will like this handy little solution mixer, which will dissolve photo chemicals about as fast as they can be weighed and dropped into the vessel. The one pictured uses a kitchen drink-mixer motor, but a motor taken from a hand-type hair drier or a boy's building set would do equally well. Don't use a large universal motor of the kind found in vacuum cleaners; it would be too heavy and powerful.

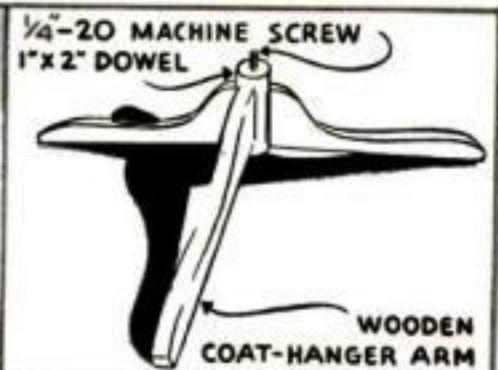
The mixing vessel should be selected before the stand is built. While the iced-drink pitcher shown may not be as professional looking as a graduate, it does have some practical merits. It is widely available and costs little, it holds over two quarts, and the handle makes it easy to use when filling bottles. The lip pours well and its two large wings can, if desired, be used to hold a wad of absorbent cotton for straining a solution.

Dimensions in the drawing may of course be altered to suit the particular motor and vessel selected. The principal requirements are that the motor clear the vessel by several inches, that the propeller shaft be centered within, and that the propeller blade

be about $1\frac{1}{2}$ " from the bottom. Use $\frac{3}{4}$ " stock for the base, recessing it to keep the vessel from moving. The upright, slotted at the top to hold the motor mount, is screwed to the base with an angle bracket.

The motor mount is made by drawing a band of sheet metal around the motor and clamping it tightly between two bolted wood blocks. Bolt holes in the band should either be oversize or filed into slots to permit easy adjustment. The ends of the band pass through the slot in the upright and are bent out at right angles, and solder is run into the vertical joint. The completed mount should drop into the slot without wobble.

A sleeve coupling, tapped for two 6-32 screws, attaches the propeller shaft to the motor. Stainless steel is best for the shaft and propeller, but ordinary steel (or even solid curtain rod for the shaft) will do if it is wiped dry after use. Hacksaw a slot in the lower end of the shaft and solder in it a small sheet-metal propeller. Adjust the blades by bending to force the solution toward the bottom of the vessel, and determine by experiment the pitch that affords maximum turbulence without splashing or overheating the motor.



Three coat-hanger arms glued to a dowel make a tripod for taking your table-top pictures.

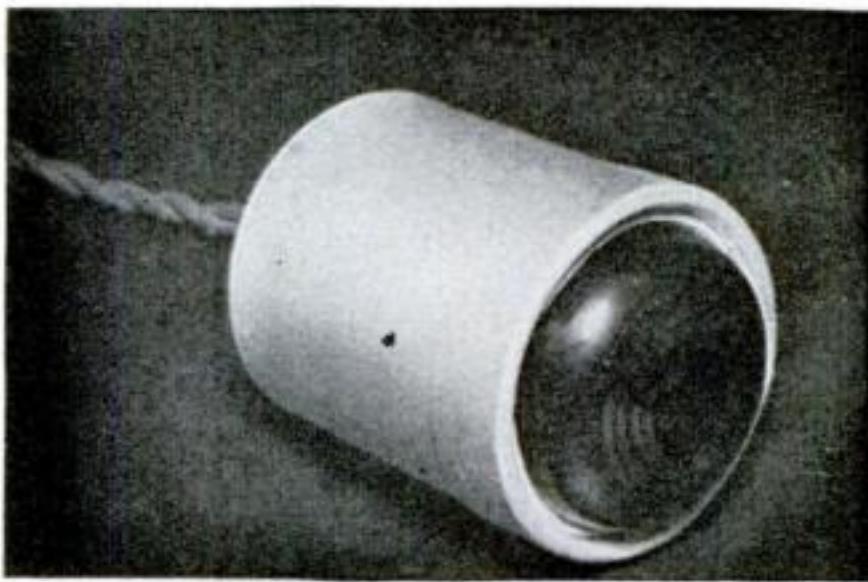
FOR A TABLE TRIPOD to be used in table-top photography, three halves of wooden coat hangers serve admirably. Rasp the inside ends concave to fit around a 1" by 2" dowel. Bore an undersize hole part way into the top of the dowel and thread in a $\frac{1}{4}$ "-20 machine screw, which fits most cameras, cut the head off, and file the burrs on the end threads smooth. Then glue and screw the legs to the dowel 120 deg. apart. Use washers if necessary to hold the camera snugly at a point where the lens comes between two legs. To tilt it, place books under one leg.—FRANK SHORE.

DOZENS OF PRINTS ARE WASHED at one time in the tank shown below, which was made from an ordinary galvanized tub. Incoming water flows against the side and swirls the prints for thorough, efficient washing. An overflow pipe, protected by a baffle, keeps the water from rising too high and the prints from collecting at the edge or going over the top.

Drill or punch an inflow hole near the bottom and solder into it a length of copper or other nonrusting-metal tubing with an inside diameter that of the hose to be connected to the water supply. Next, drill an outlet hole at the desired water level and

PHOTO IDEAS

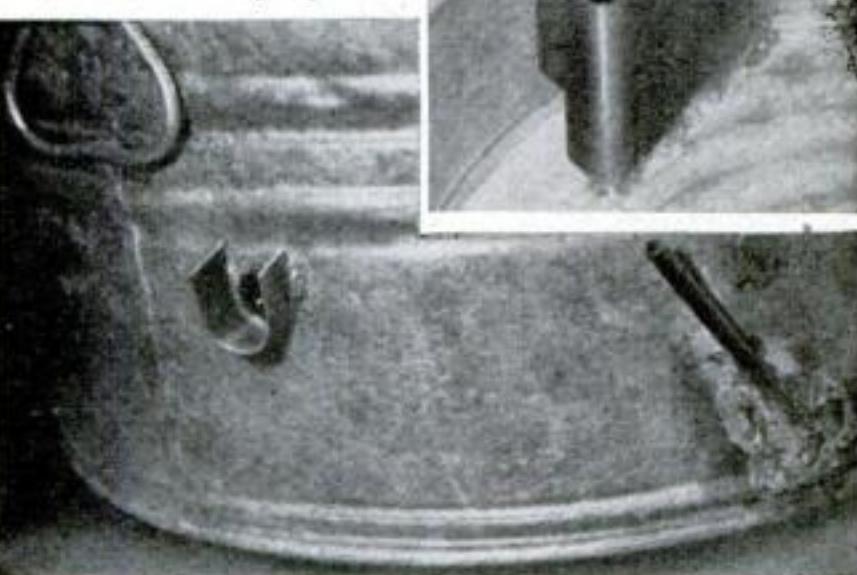
AN INEXPENSIVE SAFELIGHT is made easily from a pint-size waxed container and the ruby glass from an auto tail lamp. Cut a hole in the lid to fit the glass, which is held in with tape, and punch a hole in the bottom for an electric cord. Put a $7\frac{1}{2}$ -watt bulb in a socket inside, plug the cord hole to be certain no light will escape, and replace the lid with the lens in it.—H. K.



solder on the outside a U-shaped trough to direct the flow clear of the tank. Then solder a baffle on the inside at the overflow hole to prevent clogging by the prints. The baffle should extend above the overflow hole, and a small section should be cut out at the bottom of the baffle to admit the hypo-laden water.

Smooth all edges of drilled holes and other rough spots with emery cloth to keep the prints from snagging. Connect the hose to a faucet, place the tank near a suitable drain, and you are ready to wash your first prints as soon as the water reaches the proper level.—GEORGE T. LUNDEEN.

Both inflow and outlet arrangements are shown below. Right, a baffle prevents clogging of the outlet by prints.





Use of a figure adds interest. The scene was taken on Ansco Superpan Press film pack with a K2 filter.

SNOW PICTURES

Good Exposure and the Right Filter Provide Keys

By GLENN R. KERSHNER

*Popular Productions,
Samuel Goldwyn Studios, Hollywood*

MANY charming scenes await your camera when snow blankets the fields, caps the fences and barns, and sweeps on to the horizon. A grotesque, leafless tree or the myriad shadows cast by its branches may appeal to your sense of the dramatic. Or you may like full-textured close-ups of snow patterns themselves or the wide sweep of a landscape. Snow and ice always fascinate me—the fast action of sleds racing down steep hills, ice-covered falls in mountains, and frost-covered trees along a country lane.

Making really excellent pictures of snow and of objects in snow taxes ingenuity and adds enticement to the art of photography. The primary problem involves the subject matter itself, which, though you may not think so at first, has comparatively low

brightness range instead of the dark shadows and bright high lights that your eyes see. The fact is that the brilliant reflection of the millions of snow crystals causes considerable radiation of light, and this tends to flatten the contrast by filling in the existing shadows.

Another point apt to be overlooked is the frequent presence of certain predominant hues. These are shades of pale blue and white. Bright reds and yellows are greatly subdued or completely lacking.

Fortunately, effective contrast can be increased easily by the use of yellow contrast filters. They have two effects—by absorbing scattered blue radiation, they strengthen the shadows, and they darken the sky. Usually a medium-yellow filter serves this purpose satisfactorily, though occasionally only an orange, or perhaps a red, will give the maximum effect desired.

Snow scenes can often be strengthened



Shadows and sky were darkened by a K2 filter in this photo. Side lighting helps to give the snow texture.

THAT SPARKLE

to Winter Photos Your Camera-Wise Friends Will Envy

by the inclusion of figures or objects either in the foreground or background to add a point of interest that might otherwise be lacking in a pictorial composition. Since it is difficult, even impossible sometimes, to obtain pleasing detail in both the over-all scene and the figure, you can simplify the problem by trying only for the best picture of the scene itself. Probably the figures will then appear in dark silhouette against the white background, but they will serve their purpose by lending added interest to the general scene.

Good texture is sometimes the most important part of snow photography. Proper rendition is generally the function of proper lighting. Conventional illumination, with the light coming from behind the camera, is almost never of value for capturing snow texture. Instead, you should depend on strong back and cross lighting.

Flare, caused by scattered radiation and

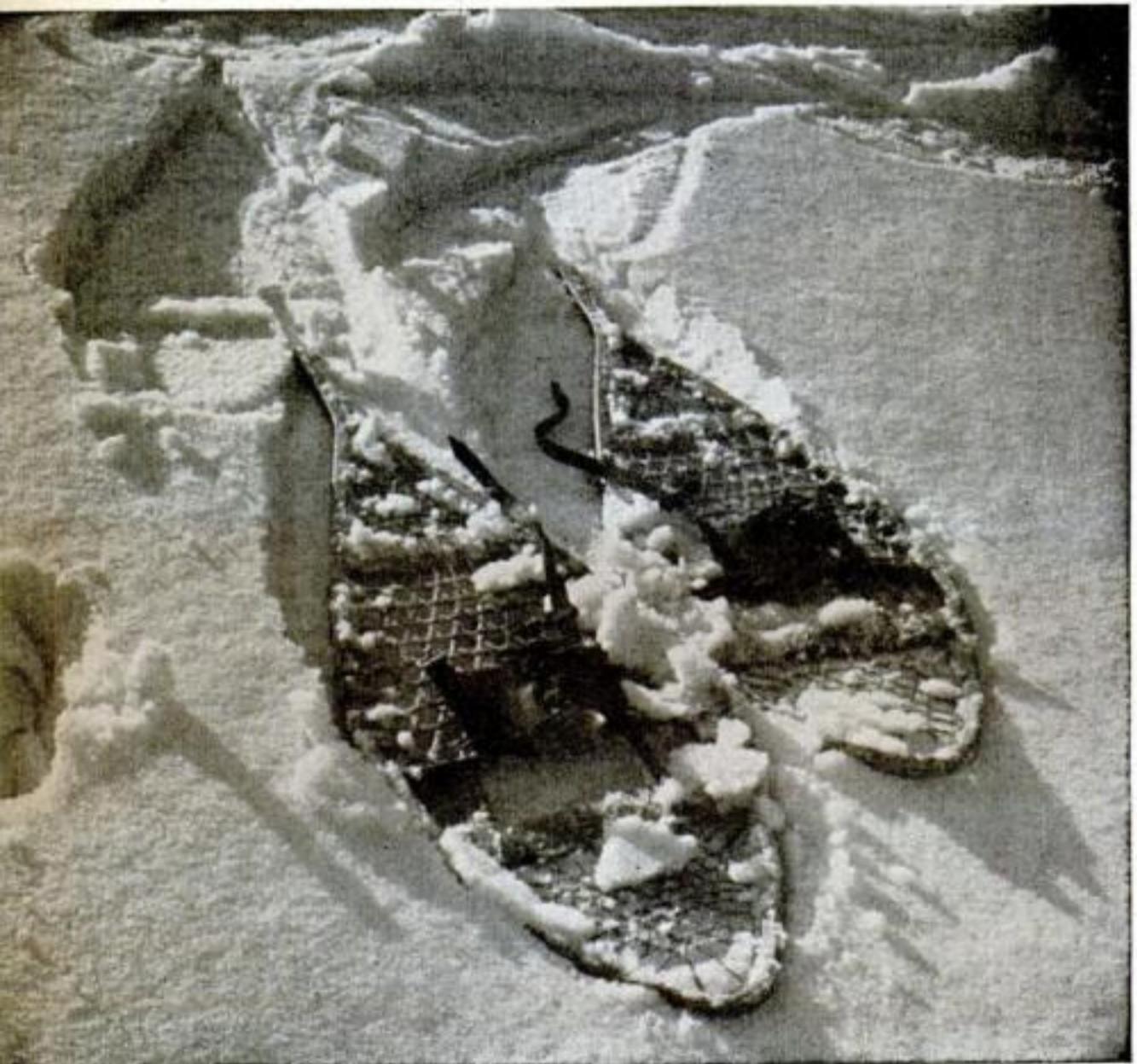
resulting in loss of contrast and detail, is no problem if a lens shade is invariably used. Make sure that no condensed moisture fogs the lens, and watch the shutter for variation from normal speeds sometimes occurring at low temperatures.

Both correct exposure and film development are extremely important, even more so than in other types of photography. The film used should possess the characteristics of long-scale, brilliant gradation and high color sensitivity to make effective the use of filters. And the emulsion speed should be high to permit short exposures and small lens openings even when filters are employed. Panchromatic film is generally preferred, though an orthochromatic film is sometimes satisfactory.

Your filter needs for snow pictures can be met by yellow, red, and green filters, with the possible addition of amber and neutral ones. Instructions for their use, including



Snow is both setting and prop for the fetching result in the view above. Note how well the snow texture is captured in the snowshoe close-up below, made on Ansco Finopan film with a Wratten G filter.



what is known as the factor number, will be found on the box. The letter *P*, which may precede the designation, simply means that the particular filter has been corrected for panchromatic film. The factor number tells you by how much, if at all, you should open the diaphragm compared to its normal setting for the same picture without a filter. What is known as a "two-time" filter, or one having a factor number of 2, requires an opening one stop wider than normal to compensate for light held back by the filter; a "four-time" filter, factor number 4, requires an opening two stops wider. In figuring diaphragm settings, remember that you double the exposure each time you open the diaphragm by one full stop. Of course, you can instead use a slower shutter speed to obtain the necessary increase in exposure.

Here's what some of the most frequently used filters will accomplish: Very light amber filters have a slight color correction for all panchromatic films, produce slight contrast, penetrate slight haze, and help to snap up faces. Ordinary light amber filters give normal correction for all types of panchromatic film, produce medium contrast, darken blue sky a few shades, bring out clouds, and penetrate haze more deeply than the very light ones. Yellow filters give full color correction, produce more contrast than amber, and are excellent on open landscapes. They darken sky slightly, strengthening the clouds, lighten all yellows, oranges, and reds, and lighten green and magenta slightly.

Light-red filters produce medium overcorrection, darken blue sky and water for night effects, lighten faces, darken greens slightly, and lighten anything red or yellow. The overcorrections of very deep red filters convert brilliant snow into night scenes, turning all faces and

red clothing white as though flooded with moonlight.

Green filters have a strong softening effect, producing green and yellow contrast. They are excellent for use on landscapes and snow, provided sky is avoided as much as possible. Neutral filters are another type sometimes used by professionals. They produce a medium softening of glare and contrasts.

In combination, light-red and green filters darken sky, bring out clouds, lighten faces, and soften both the white of snow and the shadows. When two such filters are used in combination, be sure to add their factors together and open the lens the full number of stops indicated by the total. Thus, if the factor of one is 3 and of the other 5, the combined factor would be 8 and the lens would have to be opened three full stops. It is possible to get a night effect in full sunlight with this combination by opening up only $1\frac{1}{2}$ stops instead of three.

Some filters are supplied in combination by the manufacturer. One such is a combination of the ordinary light amber and a medium neutral one. It gives moderate color correction without excessive contrasts and also softens strong glare. The combination is very satisfactory on snow scenes, and it gives pleasing values when used on open-water scenes.

When the very light amber filter is used in combination with a neutral one, the amber corrects clear blue sky slightly and the neutral slightly softens the whites. It is an unusually satisfactory combination.

Only a word need be said about taking snow pictures in color. You require no filters for this. If properly exposed, your pictures should be good. Simply take careful meter readings and follow the instructions provided with your film, remembering that accurate exposure is important.



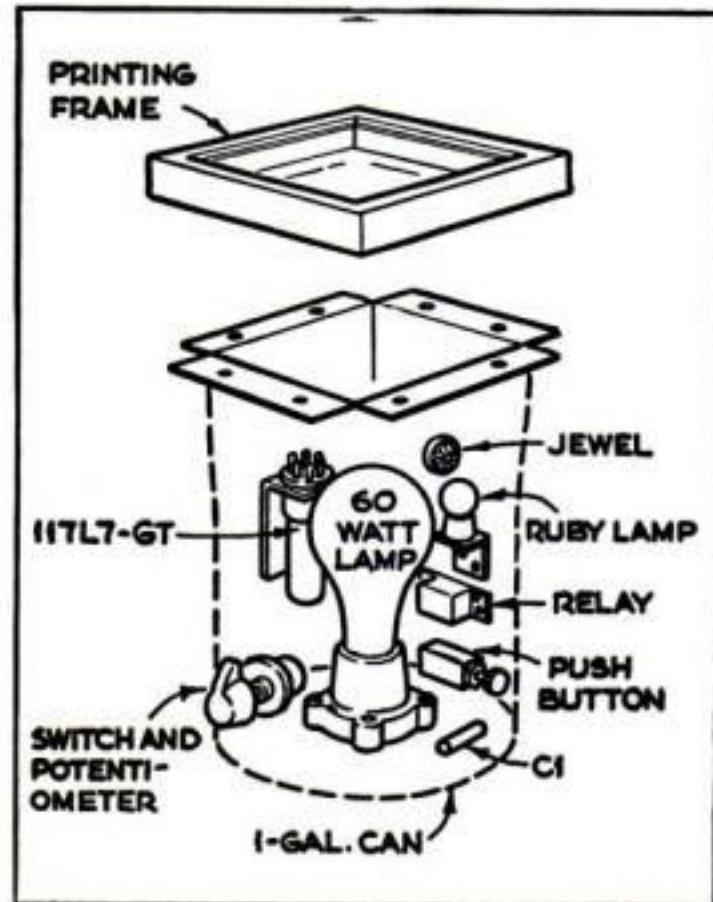
Excellent texture in the tree trunks and the snow is captured in the photo above largely as a result of proper exposure and cross light. Below, brilliant reflection from the snow crystals tends to flatten contrast by filling in shadow instead of producing the dark shadows and bright high lights that ordinarily are expected.



ELECTRONIC PRINT TIMER



Any lighttight box can be used for this timer, but the fruit can is big enough if the parts are properly laid out. The drawing, right, shows a practical arrangement.



THOSE who go for canned fruit in a big way, or can get a 1-gal. fruit can from a boarding house, have a good photo accessory at hand. Such a can is lighttight and just the right size to hold this electronically controlled contact printer.

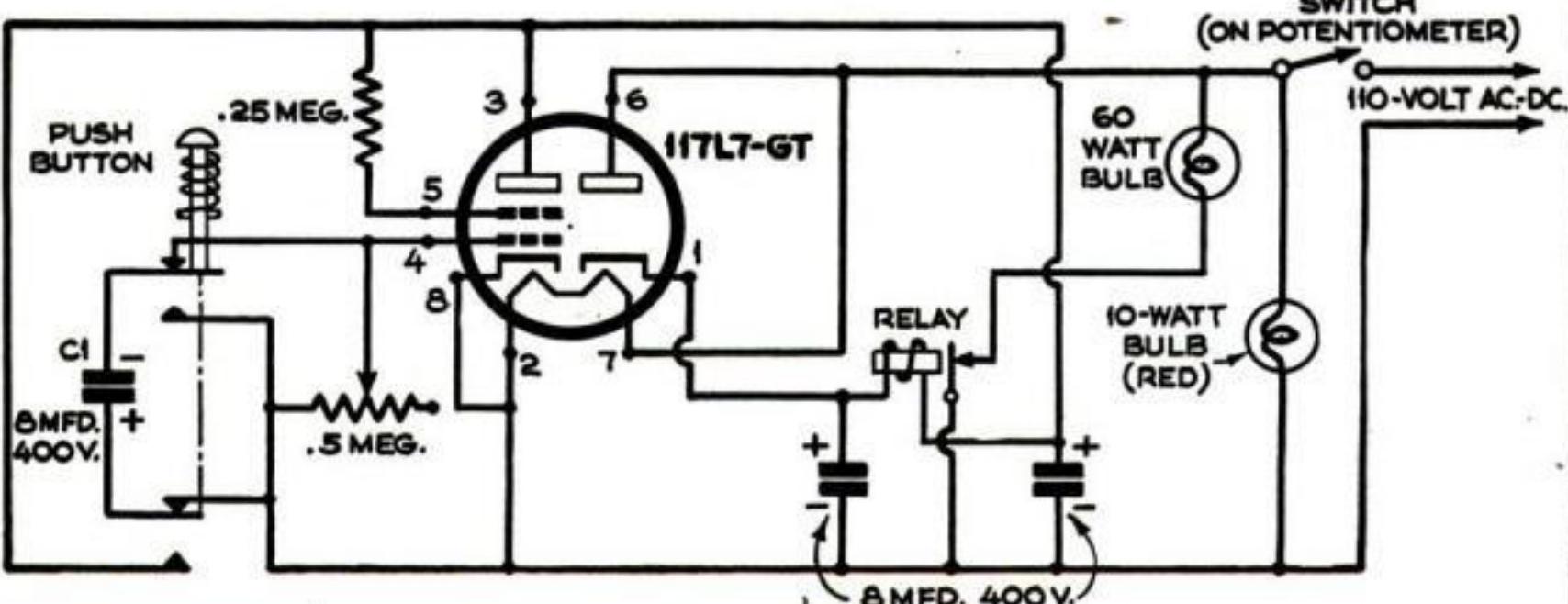
Bend the opening into a rectangular shape and mount a standard 3 1/4" by 5 1/2" printing frame as shown. A hinge between the frame and pressure plate completes the photographic part of the job. Chief components of the timer are a 117L7GT vacuum tube, a linear .5-meg. potentiometer with switch, a double-pole, double-throw pushbutton switch, and any fairly sensitive, normally energized relay rated at around 10 milliamp. and 2,000 to 3,000 ohms.

Mount and wire the parts as shown. To calibrate the timer, turn the potentiometer clockwise until you hear the snap of the

power switch. Both bulbs will light, but after the tube starts to warm up it activates the relay and cuts out the exposure light. Allow a few more minutes for the tube to get into proper operation, set the potentiometer about half way, and press the pushbutton switch for one second.

The exposure lamp should go on and then turn off automatically. Using a stop watch, time the length of exposure for various settings. Each time you get an even-second exposure, scribe the position of the knob on the can. The maximum time of this unit is about 15 seconds; for a longer maximum, increase the capacitance of C1 or the resistance of the potentiometer.

By plugging the line cord of your enlarger into the exposure-lamp socket, you can make the timer keep watch over your larger prints as well.—KARL GREIF.





WASHDAY IN THE PACIFIC

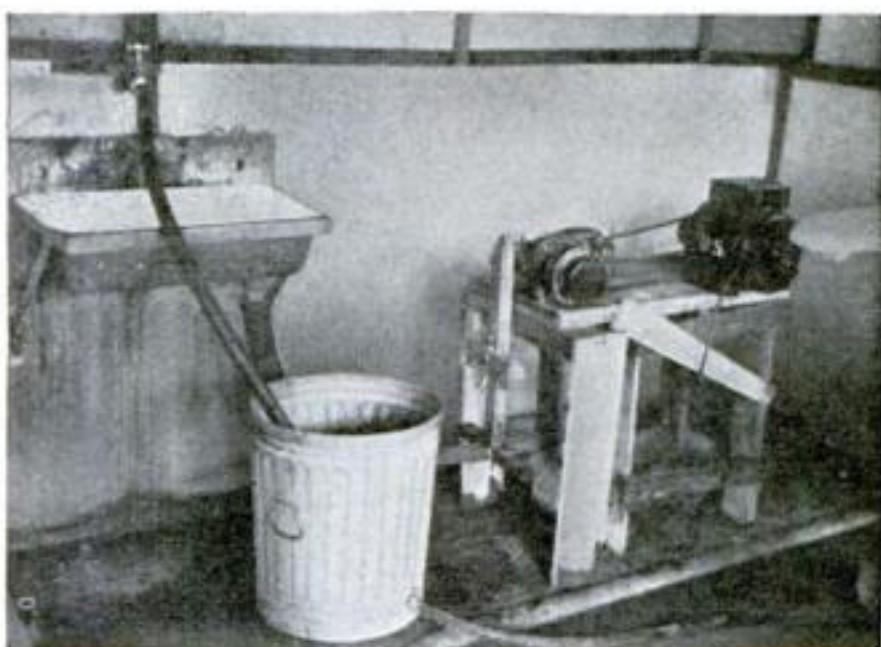


AMERICAN troops stationed at remote posts in the Pacific contrived many ingenious power laundries. Most of these washers were crude affairs, but all were better than grandmother's corrugated washboard and tub—or a GI bucket filled with water.

Windmill washers appeared on a number of islands, motive power being furnished by the brisk breezes which swept over the sand and coral. Pfc. R. F. Purdum, of Dewey, Okla., built the one shown above at the left. An old oil drum served as his tub.

But at many bases wind power was not particularly reliable. So mechanically minded GI's looked around for a gasoline engine or electric motor they could put to work.

Every man in Sgt. Mel Klausner's company in New Guinea used the laundry shown



above at the right. The sergeant, known to his comrades as "Tom Swift" because of a number of labor- and time-saving inventions, hooked up a $\frac{3}{4}$ -hp. motor with the gears of an airplane-engine inertia starter obtained at an Air Corps salvage dump, and attached to the gears a special shaft which extended into a GI bucket on the floor below. When the sergeant filled the bucket with soap and water—and clothes—the results were so good that the machine practically never got a rest.

Seabees at another Pacific jungle base set up the imposing laundry below. A one-cylinder air-cooled gasoline engine provided the motive power in this case, and oil drums again came in handy. The clothes got a good shaking up in the one made to serve as the actual washer. Others were cut down to provide rinsing tubs.



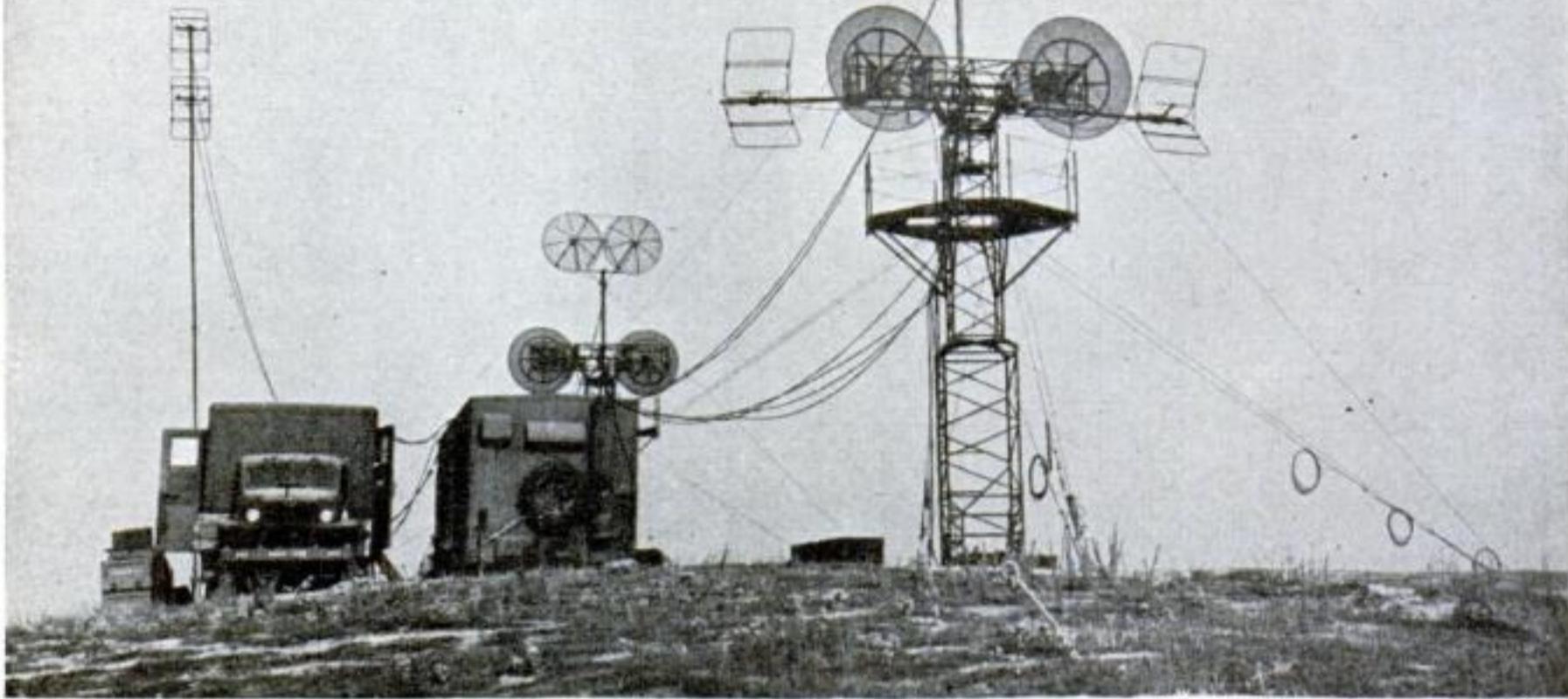


Photo by U.S. Army Signal Corps

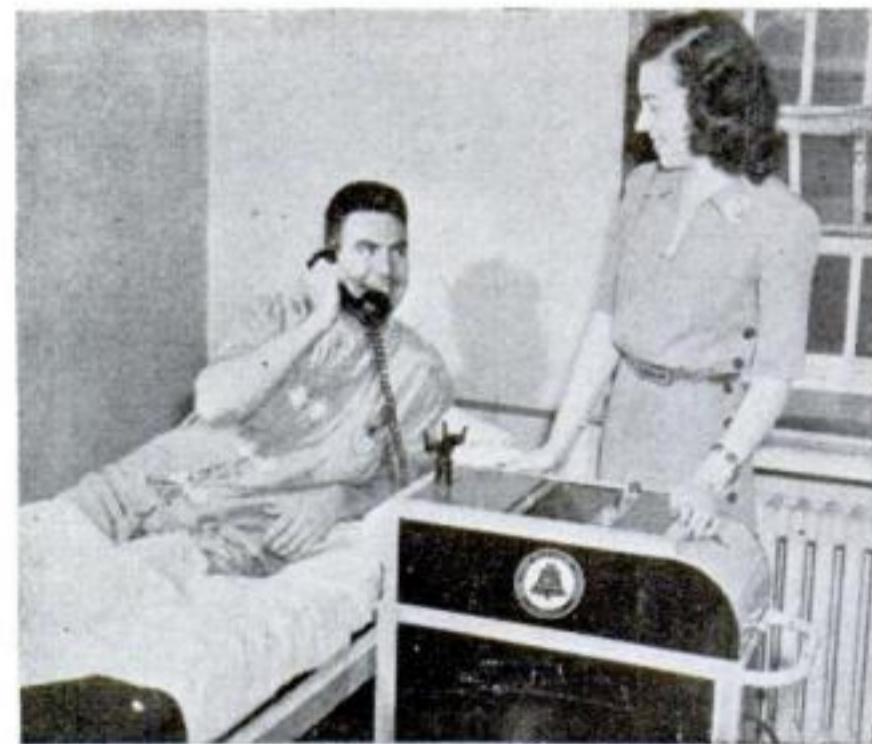
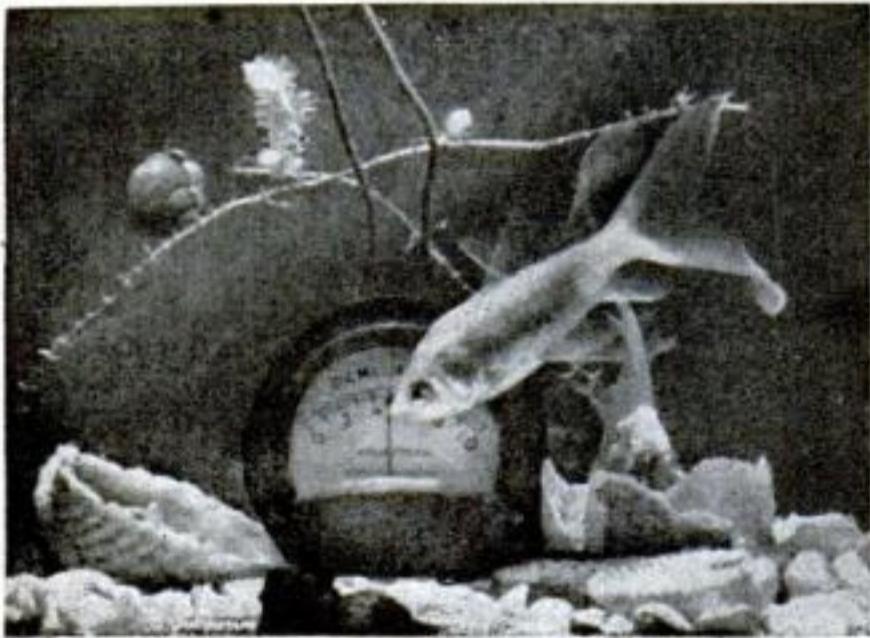
DIRECTIONAL RADIO RELAYS with weatherproof equipment in stations every 25 miles or so have been developed by the U.S. Army Signal Corps as a means of speeding communication. All have multiple channels. They are known in Army nomenclature as AN/TRC-1, 5, 6, and 8.

The latter two employ the new pulse-position modulation with time-division multiplexing. In pulse position radio-frequency

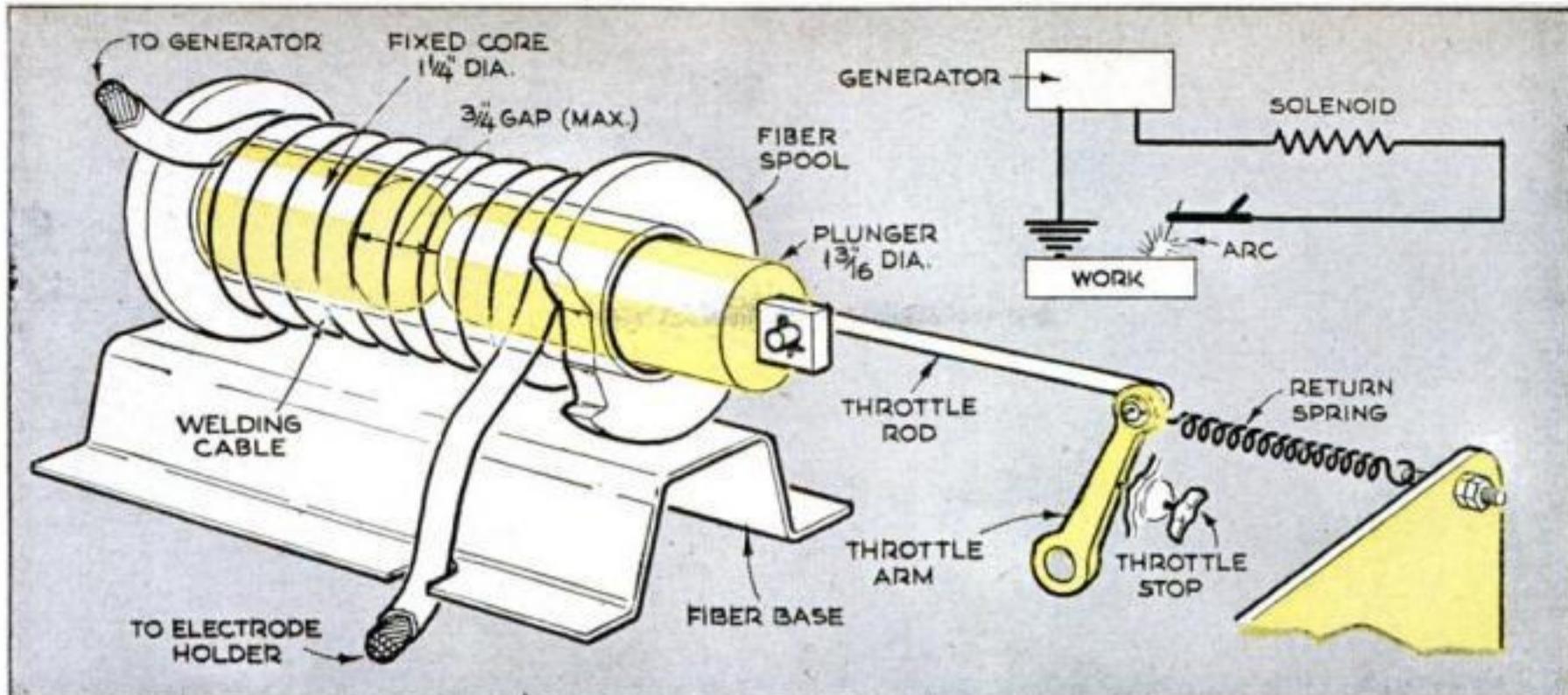
waves shoot out in microsecond bursts, not continuously as in A.M. and F.M. Eight simultaneous conversations are chopped into bits and are fitted back together at the receiver. The frequency range of AN/TRC-6 is 4,300-4,900 megacycles, that of AN/TRC-8 is 1,350-1,450 megacycles.

AN/TRC-1 and 5 are F.M., the former at 70-100 megacycles, the latter 230-250 megacycles. Each carries four phone circuits.

HERMETIC SEALING of electric instruments has been brought to the point where they perform even in a goldfish bowl. General Electric has perfected a method that seals instruments against humidity, dust, fungus, and discoloration as well as water. In tests instruments so sealed have been submerged, and also subjected to temperatures ranging from 67 deg. below zero to 185 above.

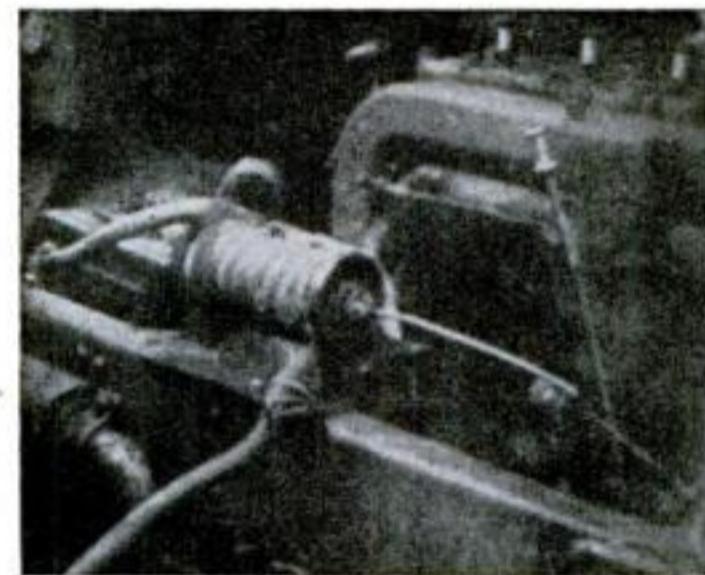


BEDSIDE SWITCHBOARDS that can handle two calls at one time connect directly with the nearest long-distance center to relieve regular switchboards at Army hospitals. The portable device, built by the New York Telephone Company, plugs into a wall jack.



Solenoid Governs Welding Generator

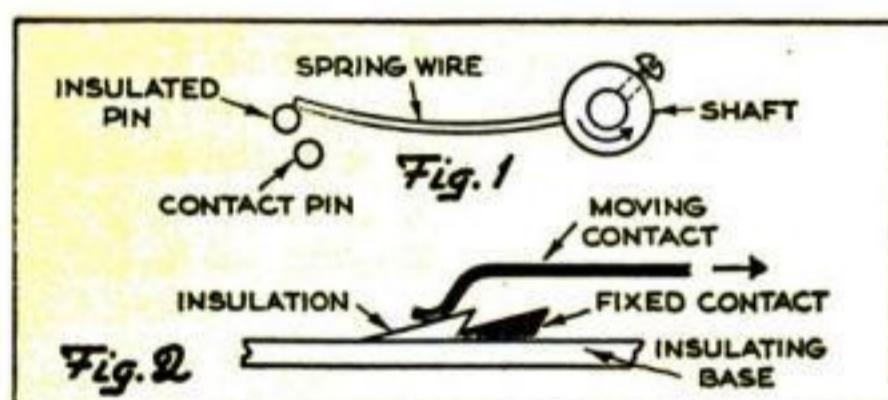
A SENSITIVE governor for homemade gasoline-driven welding generators may be built on the solenoid principle, as shown above. When the arc is struck, current flowing in the coil draws the plunger toward the fixed core, opening the throttle for the increased load; when the arc is broken, a spring returns the throttle to the idling position. The fixed core should be a soft iron rod $3\frac{1}{2}$ " long and the plunger a similar piece about $4\frac{1}{2}$ " long. Wind the solenoid with about 10 turns, using either the cable itself or wire of the same rating.—A. CRUICKSHANK.



Hookups Insulated by Pushpins



GLASS pushpins will serve as handy stand-off insulators for experimental electric hookups. They are particularly useful in "breadboard" rigs, for they can readily be located exactly where needed.—H. K.



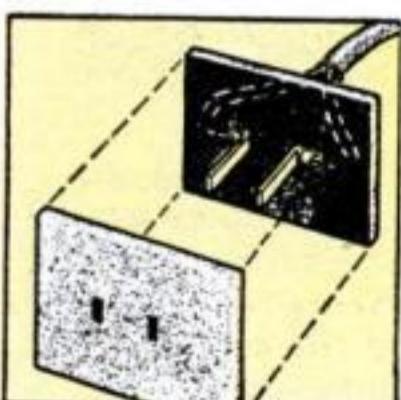
Snap Action for Slow Contacts

WITH time switches and other devices employing slow-moving electrical contacts, the slowness of the action sometimes causes arcing or chattering of relays. A light rotating contact, such as might be used on a clock shaft, can be given a snap action as shown in Fig. 1. A length of spring wire on the shaft serves as the rotating contact; it passes two pins, the first insulated and the second a stationary contact. The first pin holds the spring wire until sufficient torque has developed to snap it past to the contact.

Sliding contacts may be improved by providing an insulated ledge from which the moving contact snaps onto the fixed contact (Fig. 2), giving quick, positive closure of the circuit. A ledge on the contact itself affords a quick break.—D. H. MATHESON.

Flat Plug Made from Shoe Sole

TO PERMIT hanging an electric clock flush with the wall, I made an extra-flat plug from a dime-store rubber shoe sole. I cut two pieces about 2" by $2\frac{1}{2}$ " and made two slots in one and two holes for wires in the other. The prongs were spring-bronze strips, about $\frac{1}{4}$ " by 1". After the wires were attached, the pieces were cemented and taped together.—T. S. S.



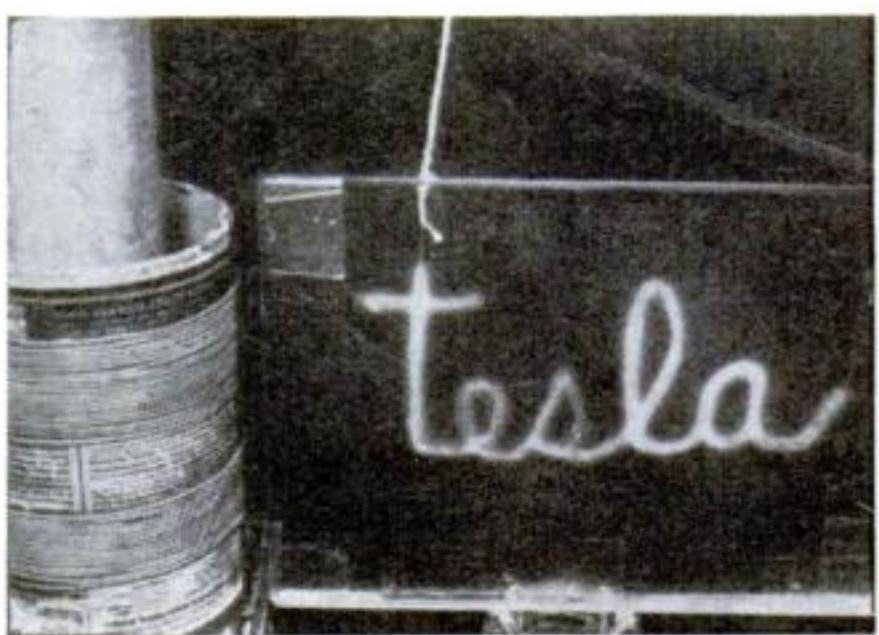


Radiant power is only part of the wonder of a Tesla coil. When brought within the field of the energized coil, an ordinary bulb glows with a strange violet light as rosy streamers shoot out from the filament.



Is this the lighting of the future? The young lady's reading light consists of a fluorescent tube without wired connections. The Tesla coil that powers the tube is located in another room, but plain walls are no obstacle to its energy.

Wires of small diameter can't confine the high-frequency currents generated by the Tesla coil. Current leaps out of the wire sandwiched between the glass plates, making it glow in the dark.



Cigar-Box Tesla Coil

WORKS WEIRD WONDERS

By Tracy Diers

"IS THERE, I ask, can there be a more interesting study than that of alternating currents?"

With this question, put to a group of outstanding engineers and scholars more than half a century ago, Nikola Tesla opened an address and an epoch. These words ushered the leading scientists of two continents into a veritable fairyland of crackling brush discharges, indescribably beautiful gaseous glows, and space-spanning energy that wires could not confine.

On that historic night, young Tesla brought into public view the wonders of high-frequency, high-voltage alternating current (H.F.H.V.A.C.). Its source was the now famous Tesla coil.

A Tesla coil is a transformer used for stepping up medium-high voltage, H.F.A.C., to fantastically high voltages. By following the instructions given on the next page, you will be able to construct a coil capable of producing all the effects described in this article. When your coil is complete, close the filament switch. Ten seconds later, close the high-voltage switch. Immediately a $2\frac{1}{2}$ " arc will leap from the high-voltage terminal into the surrounding air. If it doesn't, the primary coils are probably bucking, and either one should have its connections reversed.

The things that this corona can and will do are legion. Two of them are illustrated by the four photos on page 193. For experiment No. 1, your equipment consists of a stiff horizontal wire supported on a free-moving metal spinner. If the wire is coated with shellac along its entire length so that the corona can discharge only at the tips, then when the H.F.A.C. rushes into the wire, it will drive it merrily—and luminously—around.

Experiment No. 2 demonstrates the ineffectiveness of glass to resist the hot electrical energy that bursts forth from the Tesla coil. One of the two metal rods of the spark gap goes to the high-voltage outlet; the other returns to ground. Both are shielded from any mid-point contacts. When the gap operates smoothly, insert a sheet of $\frac{1}{4}$ "

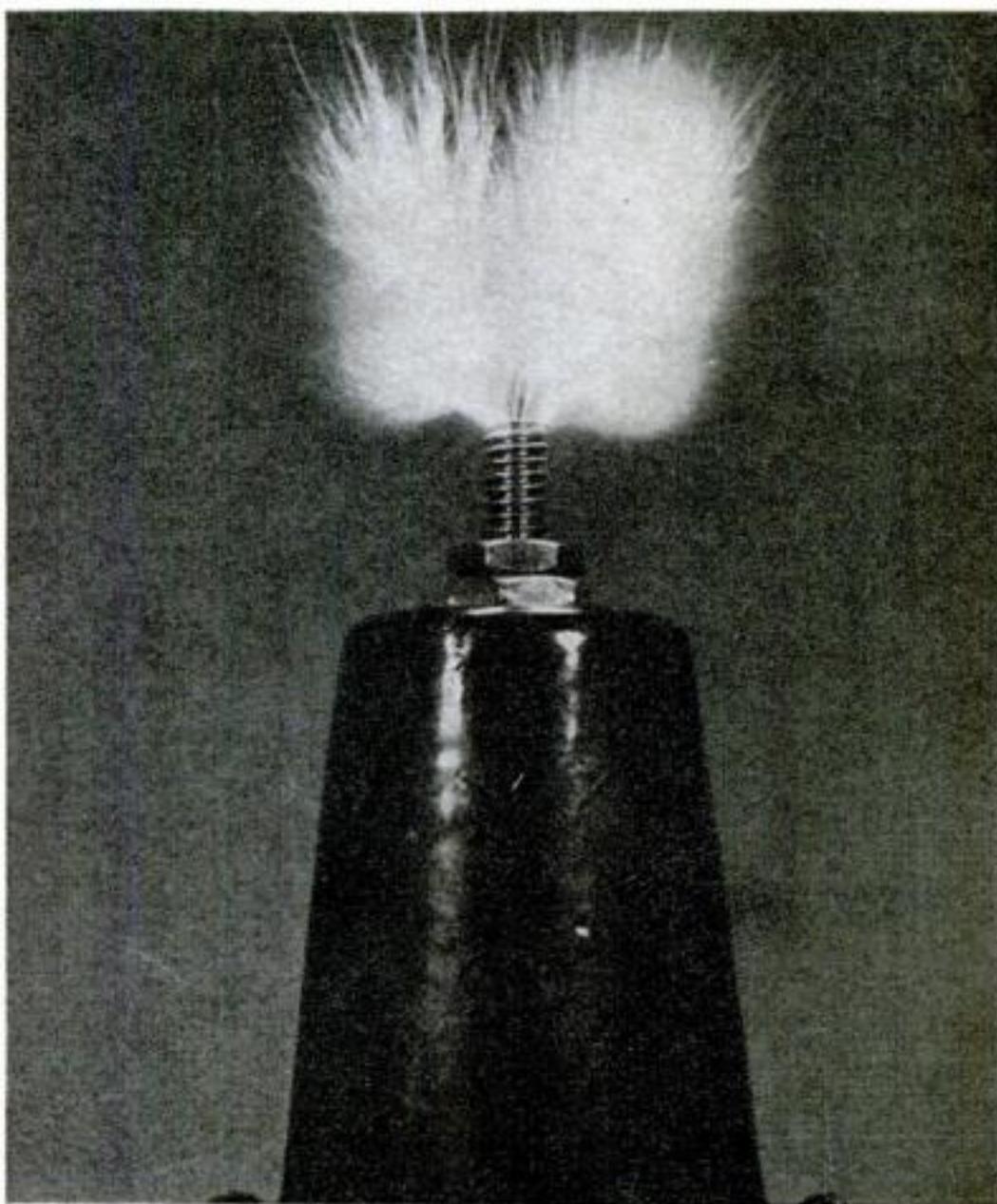
High voltages don't like to be fenced in. It's a serious problem for engineers, but for Tesla-coil experimenters the corona, right, is a welcome sign.

plate glass—and watch the spark continue right through.

Notwithstanding these facts and its terrifying appearance, the corona is quite harmless. If you hold a copper rod in your hand and bring its free end close to the discharge, the current will jump to the rod, and race via your body back to ground. But you won't even feel it!

Not enough current? Don't kid yourself! While it is true that the power output of this coil is not very high, 50,000 volts at the current you have here would normally ferry you into another world. Safety lies in the frequency of the current, which is well above a million cycles a second. All high-frequency currents travel on the surface of conductors; when you are the conductor, your skin carries the current and your internal organs aren't affected.

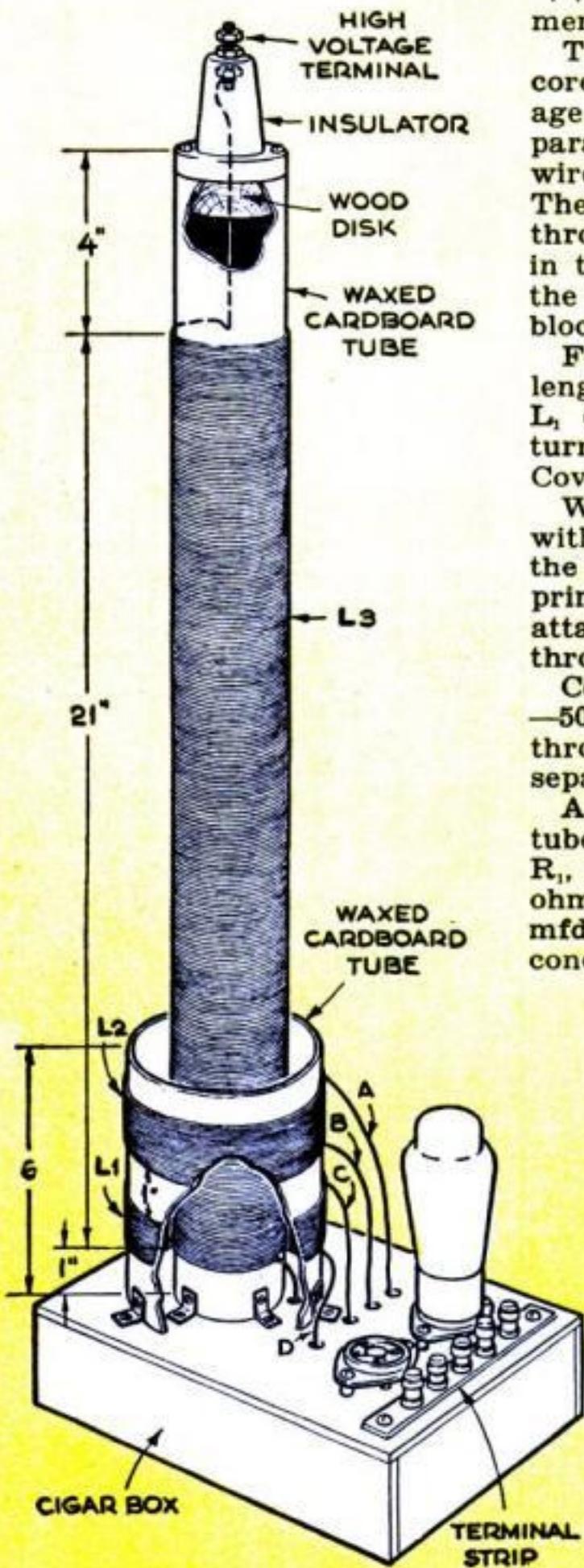
A much more strikingly visual proof of this phenomena is shown at bottom right on the facing page. Since H.F.A.C. insists on traveling only on the surface of conductors, these conductors may be hollow pipes instead of wires, but they must have



surface area—lots of it. If you try to conduct high-frequency currents through fine wires without enough surface area, the current will leap clear into the surrounding air, causing the inadequate wire to glow with a ghostly light. If you spell out a word with a continuous piece of 30- or 32-gauge bare copper wire, connect one end to the high-voltage terminal, and sandwich it between glass, the word will light up.

One of Tesla's great dreams concerned the transmission of power without wires. He didn't quite make the idea practicable, but he came close enough to enable you to amaze your friends and amuse yourself with these stunts based on wireless power transmission. Connect a metal plate to the high-tension terminal. This power transmission plate must be well insulated from the ground. A short distance away, arrange another in-

Induction Coil Replaced by Vacuum Tubes in Cigar-Box Tesla Coil



WITH a Tesla coil built from a few familiar radio parts you can try for yourself the fascinating experiments described in this article.

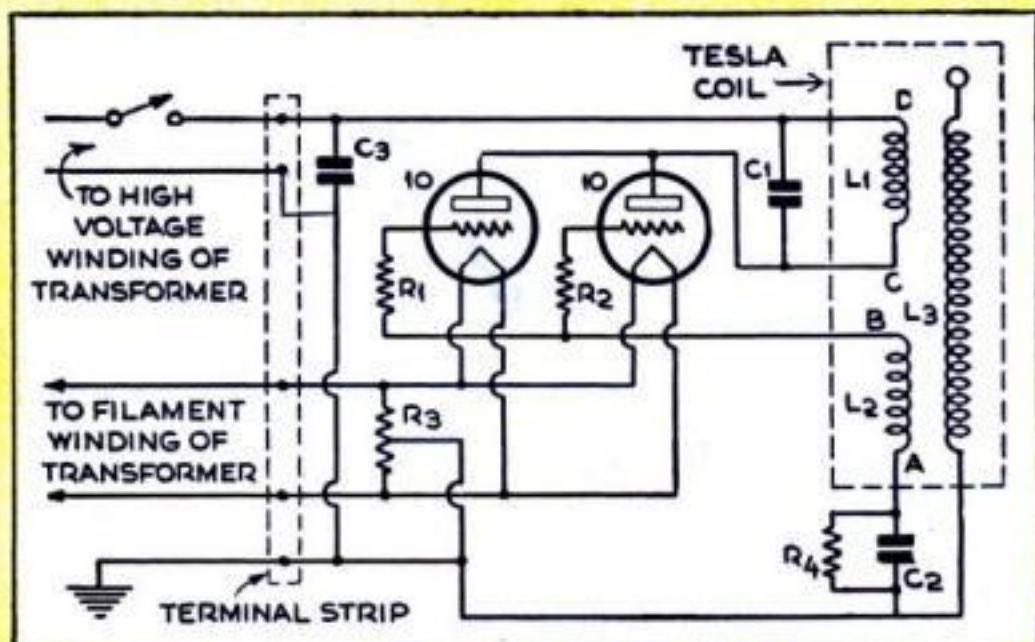
The coils are wound on ordinary cardboard tubes. A core $2\frac{1}{2}$ " in diameter by 26" long is used for the high-voltage secondary. Coat the outside of the tube with hot paraffin, and, when dry, wind a 21" coil of 30-gauge D.C.C. wire evenly and smoothly, starting 1" from the bottom. The end of this wire is brought up inside the tube through a wood block and insulator. Drill a $\frac{3}{4}$ " hole in the round block, boil it in paraffin, and glue it into the top of the tube. Screw the insulator directly to the block.

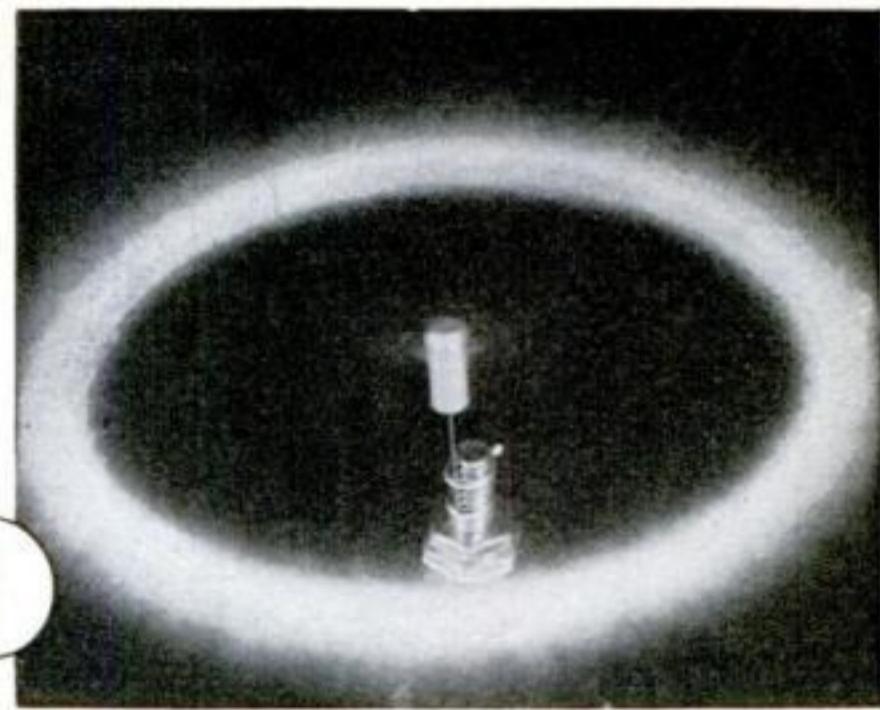
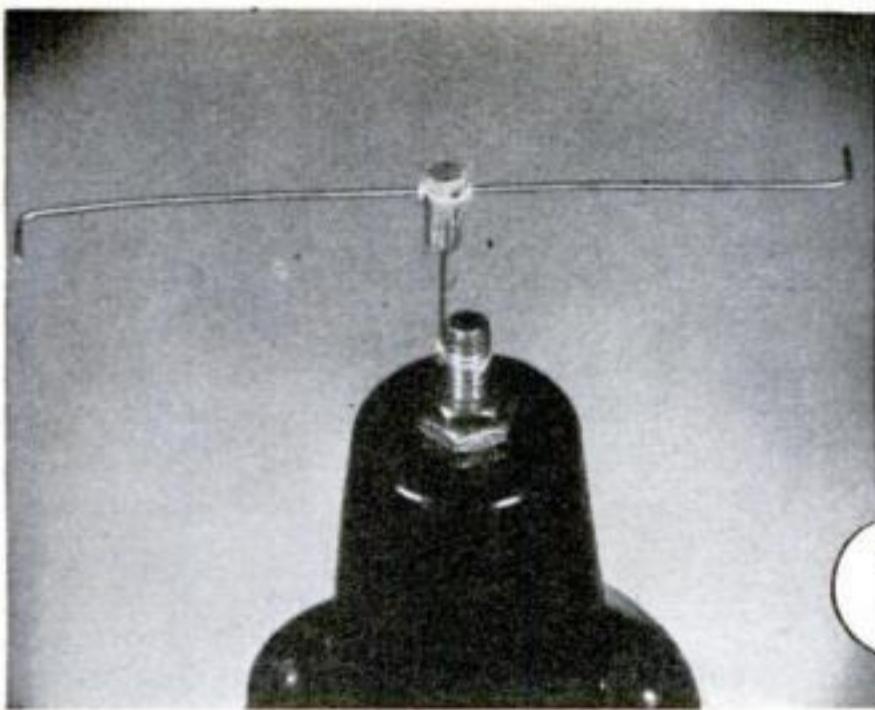
For the other coils, cut an oatmeal box down to 6" in length and use 16-gauge D.C.C. wire for both windings. L_1 can start 1" from the bottom and extend for 15 turns. Leave another 1" space and wind 20 turns for L_2 . Cover all the coils with a good shellac.

When dry, attach the secondary coil to the cigar box with small metal brackets. Bring the ground lead inside the box, making sure that it does not come near the primary. Then slip the larger form over the other and attach it in the same way. Carry the leads into the box through four small holes and fill the holes with shellac.

Connect the high-voltage side of a power transformer—500 volts or more—to the input of the Tesla coil through a single-pole, single-throw switch, and use a separate switch for the filament leads.

A pair of four-prong sockets is needed for the type-10 tubes; other parts shown in the wiring diagram are: R_1 , R_2 : 2,700 ohms, 10-watt wire-wound resistors; R_3 : 40 ohms, center-tapped; R_4 : 5,000 ohms, 10 watt; C_1 : .001 mfd., 1,000-volt mica; C_2 , C_3 : .0005 mfd., 1,000-volt mica condensers.

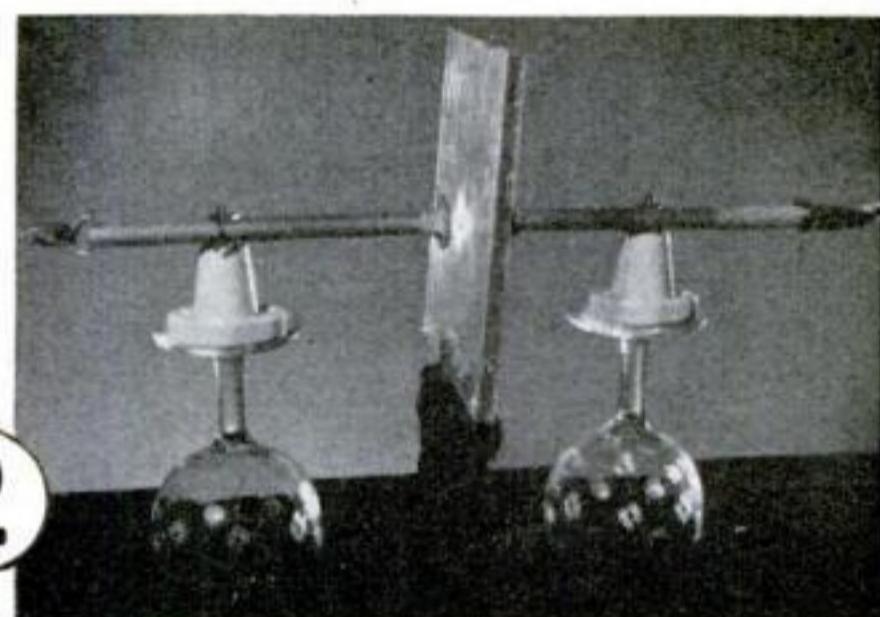
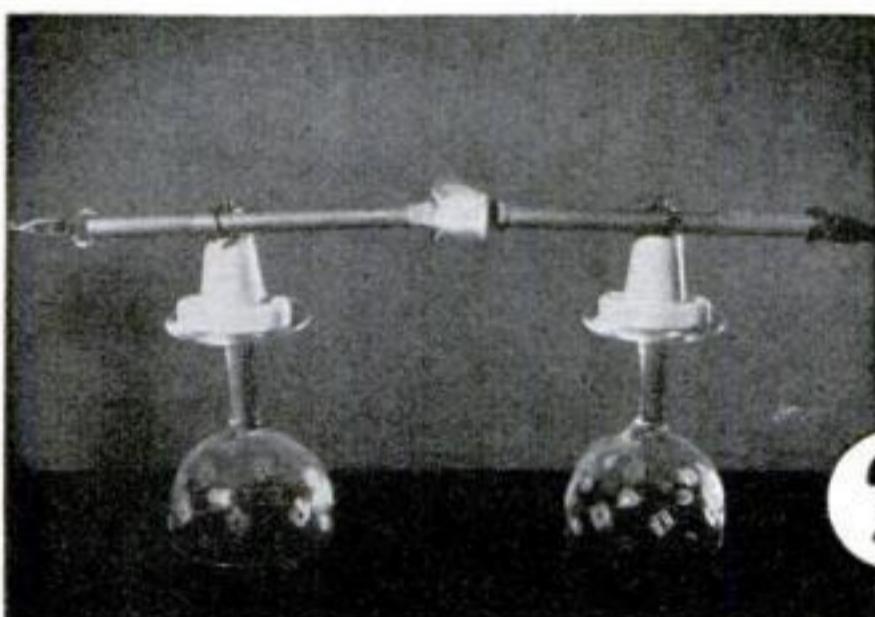




1

The spinner used in this experiment can be made of any light wire. Drill a small hole so that the metal will pivot on a pin attached to the high-voltage terminal. Shellac all but the tips of the horizontal wire.

If you've always had high respect for glass as an insulator, make the test shown below. The spark seems to jump the gap despite the $\frac{1}{4}$ " glass plate. You may have to shorten the gap a bit after inserting the glass.



2

sulated plate so that its face is parallel with that of the first. If you touch this power-receiving plate with a screwdriver, you will draw sparks from it even though it has no wired connection with any source of electrical energy. At still greater distances—say 8' to 10'—you should be able to light a neon tube by bringing it close to the receiving plate. Small nails scattered on the table between the two plates will also throw sparks at your screwdriver.

Now for the public part of your demonstration. Place the Tesla coil in one room and locate the power-transmitting plate close to a wall that connects with another room. Draw a chair up to the adjoining wall in the second room—preferably darkened—and begin to read a book. Do you need light? Easiest thing in the world! Just pick up a 20- or 30-watt fluorescent tube. As long as you keep your hand on the tube, it will stay lit. This works well as far as 12'. Perhaps it even presages the day when we will carry our lamps from room to room without wires.

Are you tempted to do just that with

your homemade Tesla coil? Well, don't! In the first place the system would prove relatively inefficient. Even more important, it will reduce your neighbors to a state of frenzied hair pulling. This is a point well worth bearing in mind when conducting your experiments. All high-voltage devices generate some static, causing interference with radio and other electrical equipment in the vicinity. Out of consideration for your neighbors, you should avoid using your Tesla coil at those hours when you know that most people are listening to their radios.

Clearly, a good deal of electrical energy is popping out of your Tesla coil. As you might expect, it packs a lot of heat. Hold the end of a cigar or cigarette close to the output tap, and it will readily light up. If you pass the cigarette through the corona, a large number of tiny holes will appear in the paper. An alcohol-soaked cloth will also burst into flames on being brought into contact with the corona.

Fine metal wire, such as steel wool, provides a fine fireworks display. Arrange a



The stiff wire shown at the right carries the high voltage from the coil output to a wad of steel wool spread out on the loop. Can the steel wool take it? See above.

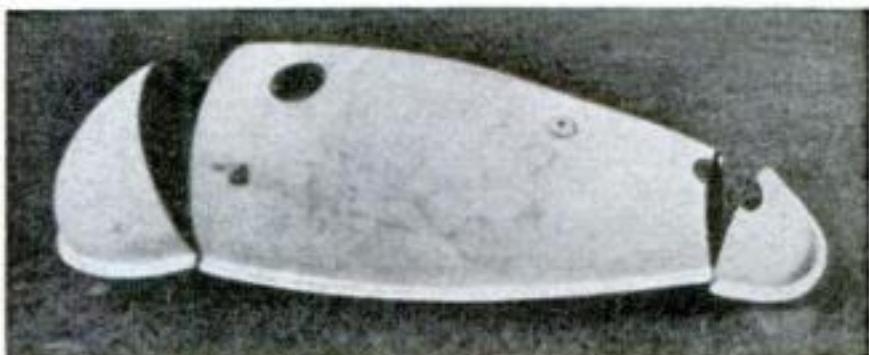
stiff wire structure, as shown at right, so one end will make contact with the terminal and the rest is well insulated from ground. Spread some steel wool across the wire loop and close the Tesla-coil switch. The steel wool will carry the current for a moment only—then it becomes white hot and disintegrates. That's a picture of what's left of the stuff right above.





For Easier Farming

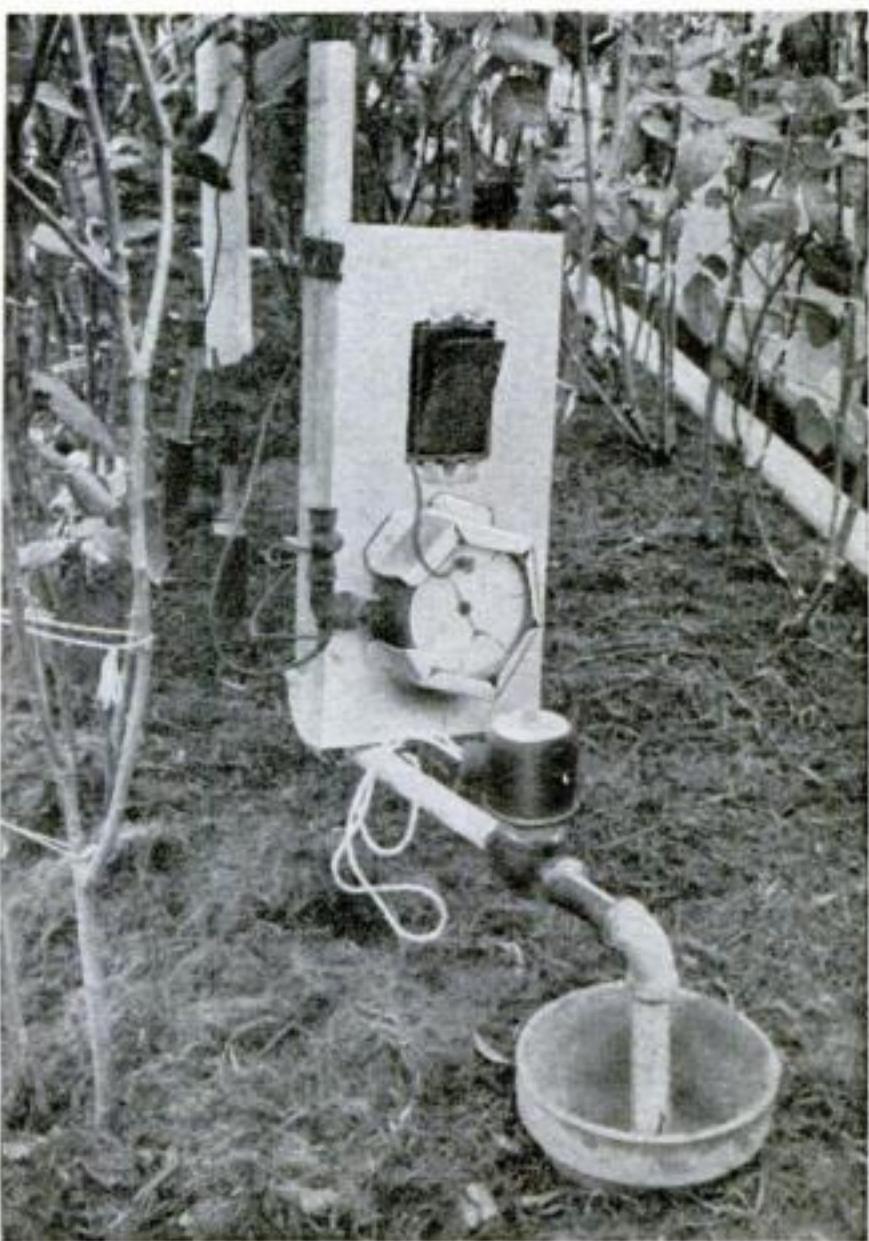
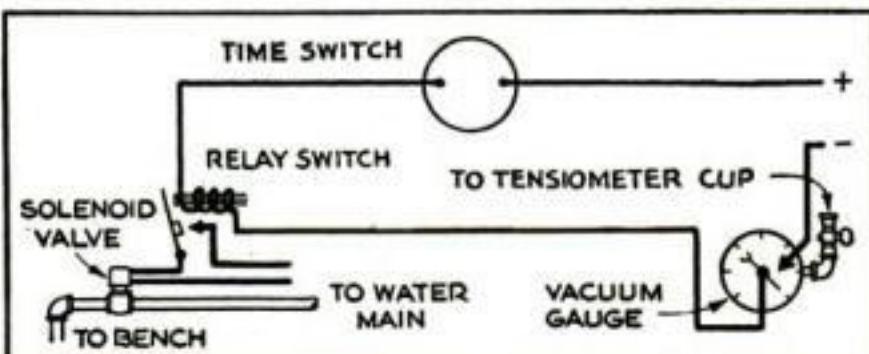
PLANE PARTS FEED BIRDS in the rig at left. A droppable fuel tank, now surplus, was modified by George H. Smith, of Sauquoit, N. Y., into a dry-mash chicken feeder of 140-lb. capacity. Below, the plastic tank is shown cut into three parts. The smallest section, which serves as a spreader, was inverted in a metal bushel basket set on legs. The middle part was suspended to hold the feed, and the larger end is a cover.



AUTOMATIC BENCH WATERING. With a soil tensiometer and vacuum gauge to measure moisture content, the Cornell University agricultural experiment station makes watering of plants completely automatic. As shown in the diagram at right, the gauge is connected to a relay switch that operates a solenoid valve in the water line. A time switch closes the circuit at two-hour intervals, leaving it closed long enough to inject the proper amount of water.

When moisture content drops, the hand on the vacuum gauge moves upward, eventually touching a wire on the face. When the time switch next energizes the circuit, the relay turns on the water, leaving it on until the time switch breaks the circuit. Meanwhile water moves through the soil by capillary action, causing the hand on the vacuum gauge to drop back. "On" periods of the time switch cause watering only when the vacuum-gauge hand also closes the circuit. Thus the watering cycle is instituted by demand from the tensiometer, but limited by the time switch to compensate for lag in water dispersal.

FENCE POSTS LAST LONGER when chemical preservatives are introduced into their sap streams, according to a bulletin of the United States Department of Agriculture. Freshly cut saplings are propped for about six hours in a tub or trough of chromated zinc chloride, zinc chloride, or copper sulphate. Tests show that chromated zinc chloride, though more expensive, has more protective value and corrodes staples less.



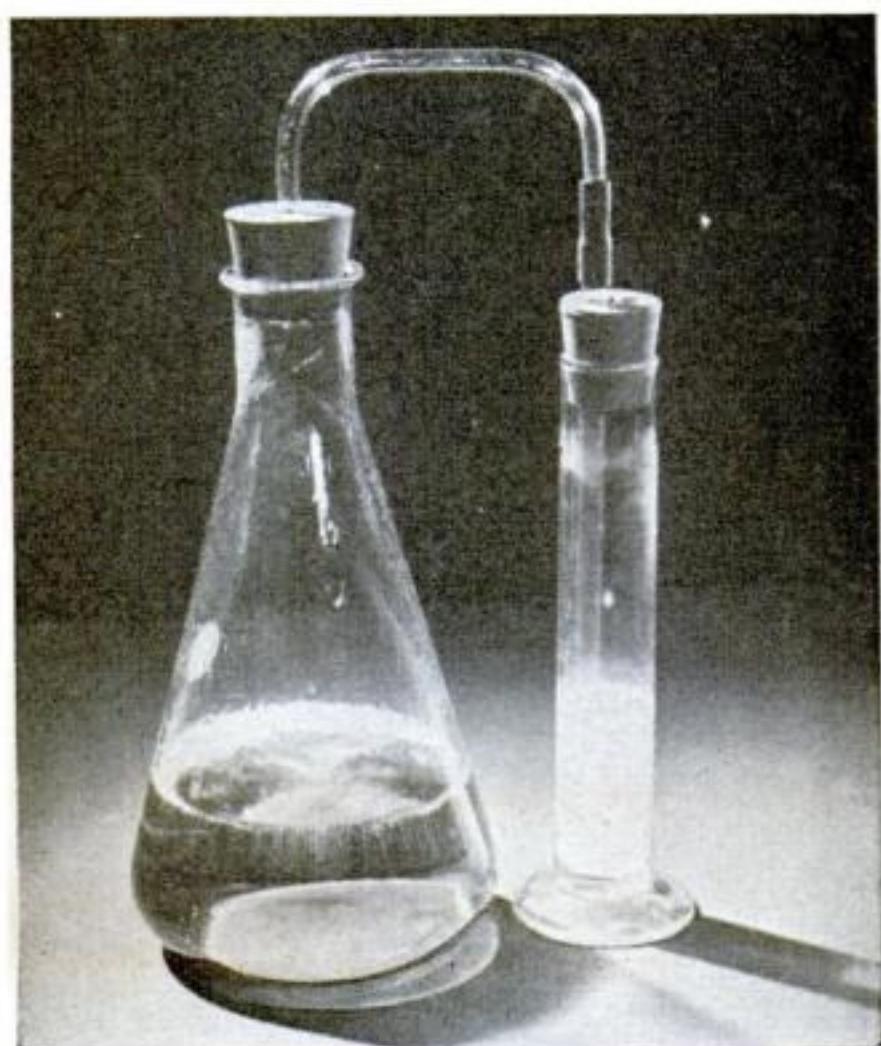


Lab distilling apparatus—distilling flask at left, condenser in center, and collecting flask at right.

ALCOHOL . . . HANDY MAN OF CHEMISTRY AND INDUSTRY

These Experiments Show Chemical Traits of a Useful Liquid

By KENNETH M. SWEZEE



TO A CHEMIST, the word alcohol indicates a great family of organic compounds. Such combinations already have been made by the hundreds, and thousands more are theoretically possible. Methanol (wood alcohol), ethanol (grain alcohol), isopropanol (rubbing alcohol), and glycerol (glycerine) are a few of the common ones. An "ol" ending on a chemical name generally means alcohol.

Ethyl alcohol—grain alcohol, spirits of wine, or just plain alcohol—is by far the most prominent child of this family. In beverages and medicines made from fermented fruits it dates to the beginnings of history. Still used for both those purposes, ethyl alcohol today also is one of the most

Fermentation, first step in the most common method of making alcohol, can be demonstrated with this set up. For distillation, the second step, use the laboratory apparatus pictured at the top of page.

important industrial chemicals. During 1944, some 640,000,000 gallons—four times the previous peak production of the country—were used in making war supplies.

Industrial alcohol is *denatured ethyl alcohol*—alcohol which has been made unfit for beverage purposes by addition of poisonous substances or substances with a disagreeable taste or odor. Such alcohol is sold tax free for use as a fuel, a solvent, an anti-freeze, or in one of thousands of special industrial applications.

Like all the alcohols, ethyl alcohol (C_2H_5OH) is a substance containing carbon and hydrogen with an oxygen-hydrogen group. Take the gas ethane (C_2H_6), knock off an atom of hydrogen, replace it with an OH combination, and presto! you have conjured up C_2H_5OH —ethyl alcohol.

On paper this change is simple. But not so in actual practice. Thus far, chemists have had to use roundabout methods to accomplish the transformation. The age-old process of fermentation still is the most common method. Yeast is added to a dilute solution of a simple sugar, the yeast plants produce an *enzyme*, and the latter acts as a catalyst to change the sugar into alcohol and carbon dioxide.

You can easily demonstrate this important process in your home laboratory on a small scale. Corn syrup (glucose, $C_6H_{12}O_6$) is a good simple sugar for the experiment. Pour 25 ml. of this syrup into 250 ml. of water in a flask; then add to this a quarter of a yeast cake which has first been worked into a cream with water. Provide the flask with a one-hole stopper and a delivery tube leading from it to the bottom of a small bottle or glass cylinder. Pour some lime water into the cylinder and

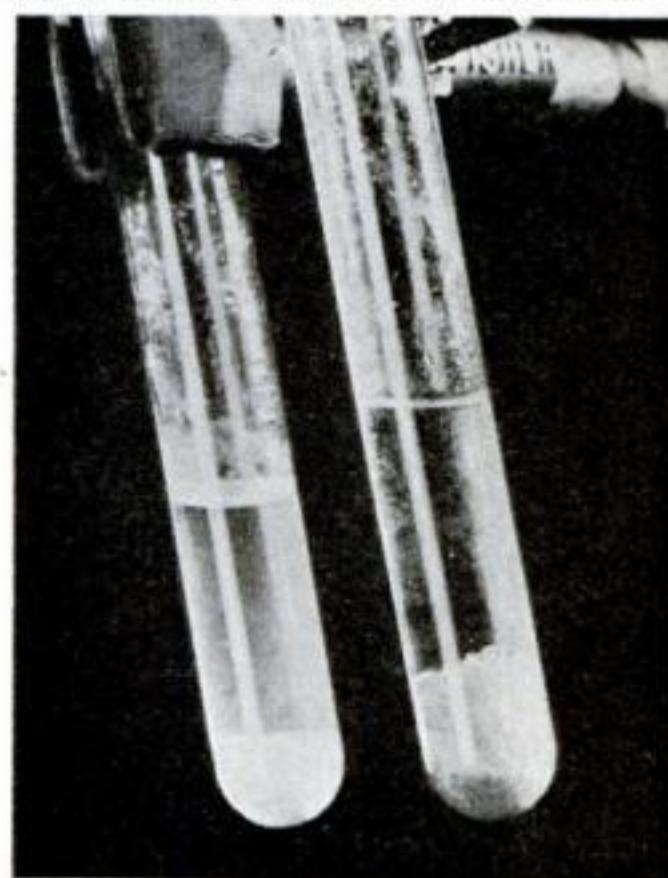
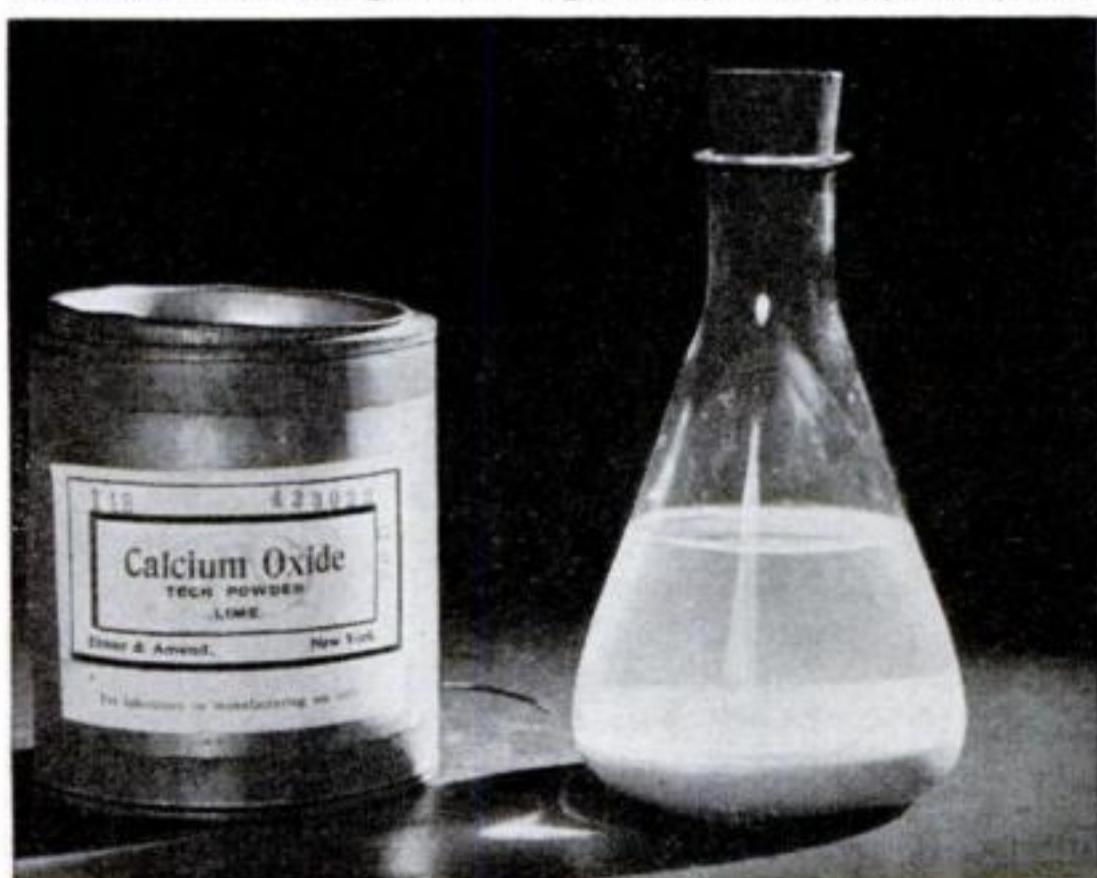
Distillation yields alcohol of not more than 95 percent concentration, but slurring with calcium oxide removes the remaining water. Right, anhydrous copper sulphate turns blue if any water remains in alcohol.

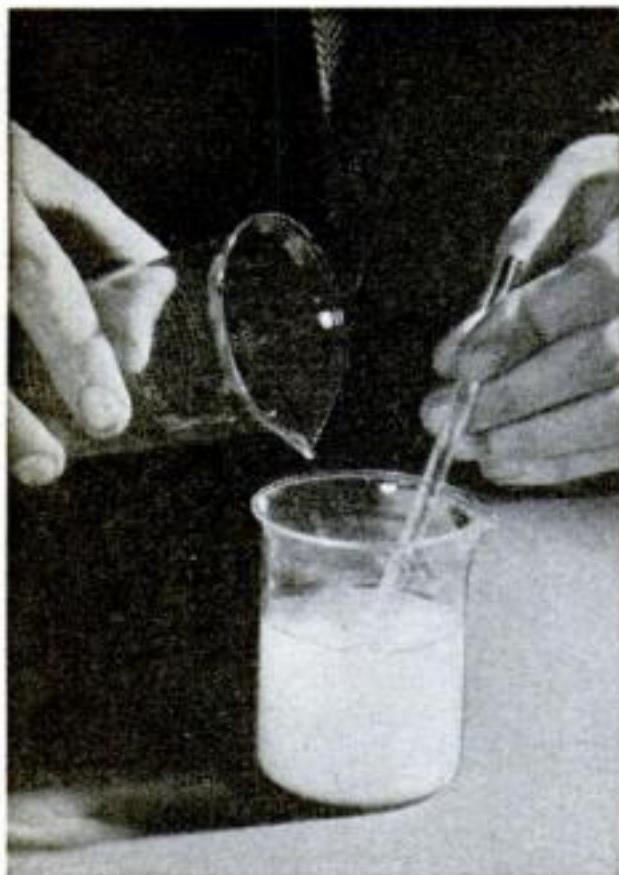


Blow into a reagent made of 5 ml. of concentrated nitric acid, 95 ml. of glacial acetic acid, and a drop of potassium chromate solution. If you have been drinking, the yellow solution will turn blue.

cork it with a two-hole stopper, leaving one of the holes open to permit escape of gas.

Let this apparatus stand in a warm place for two or three days. At the end of 24 hours, fermentation will be proceeding vigorously—froth appearing on the top of the solution and bubbles coming up through the lime water. That the gas being given off is





Mix denatured alcohol with calcium acetate solution and they will turn quickly into a solid substance. This solid is one form of canned fuel.

Place a little canned fuel on a can cover or bottle top, then light it. It will burn steadily as long as any alcohol remains.

Reaction of alcohol and an organic acid produces an ester, often used as a flavor. Addition of a little sulphuric acid speeds the reaction.

carbon dioxide is indicated by the fact that the lime water has turned milky white. The chemical reaction is this: $C_6H_{12}O_6$ plus yeast gives $2C_2H_5OH$ plus $2CO_2$.

Fermentation cannot increase the percentage of alcohol indefinitely, however. When the alcohol reaches 12 to 16 percent, fermentation stops. Further concentration is accomplished by distillation. Since alcohol boils at 78 deg. C. and water at 100 deg. C., the first vapor is rich in alcohol.

Home distillation of alcohol on a large scale is dangerous and unlawful, and any such attempt is to be discouraged. However, the small-scale distillation described in the next few paragraphs is legitimate and safe, and provides an excellent introduction to an important laboratory operation. Later, you can distill water this way.

Arrange the apparatus as shown in the photo at the top of page 196. Through a one-hole stopper in the neck of the 500-ml. distilling flask insert a thermometer so the bulb is just slightly below the opening of the side arm. A condenser can be made from two glass tubes, one about 1" in diameter and 12" long and a longer one $\frac{1}{4}$ " in diameter. Pass the small tube through holes centered in stoppers fitted to the ends of the large tube, then make an additional hole in each stopper and in each place a small tube for the water outlet. If the lower connection is used as the inlet and the upper as the outlet, the water jacket will always be full.

Put only about 125 ml. of your fermented sugar solution into the flask. Add a few

marble chips to the solution to prevent violent boiling and use an asbestos-coated screen under the flask. In the distillation of alcohol or other inflammable substances, *make sure that the stopper of the flask and all connections between flask and condenser are tight. A flask over the lower end of the condenser will catch the distillate.*

Now turn on the water through the condenser and light a flame under the flask. Watch the thermometer carefully. When vapor begins to rise and condense, the thermometer probably will read a little above 78 deg. C. This vapor is chiefly alcohol. Keep the flame as low as possible.

There are several tests to prove that your product is ethyl alcohol. Add about 5 ml. of iodine solution (made by dissolving 2 grams of iodine crystals and 6 grams of potassium iodide in 100 ml. of water) to 5 ml. of the distillate; then add sodium hydroxide solution until the brown color just disappears. Heat gently and set aside for a few minutes. A fine yellow precipitate with a pungent odor forms. This is iodoform (CHI_3). Although acetone and a number of other compounds can be converted into iodoform by this procedure, in this particular case—where there is no possibility of the presence of these other compounds—the proof is for ethyl alcohol.

Another and more spectacular check can be obtained with a reagent made by mixing 5 ml. of concentrated nitric acid with 95 ml. of glacial acetic acid and adding one drop of a solution of potassium chromate (1 part chromate dissolved in 9 parts of

water). Add to this solution a few drops of your distillate and warm it slightly. If ethyl alcohol is present, the yellow solution will turn blue. This reagent also can be used as a breath test for intoxication.

Even with the finest distilling apparatus, 100 per cent pure, or *absolute*, alcohol cannot be made directly by distillation. The purest contains 4 or 5 percent water. One method of removing this water is to mix the 95 percent alcohol with calcium oxide, and redistill it. The water then unites with the calcium oxide. For test purposes you can simply mix some 95 percent alcohol with some lime (calcium oxide). Stopper the flask and let it stand several days. The clear liquid above the settled lime is nearly absolute alcohol.

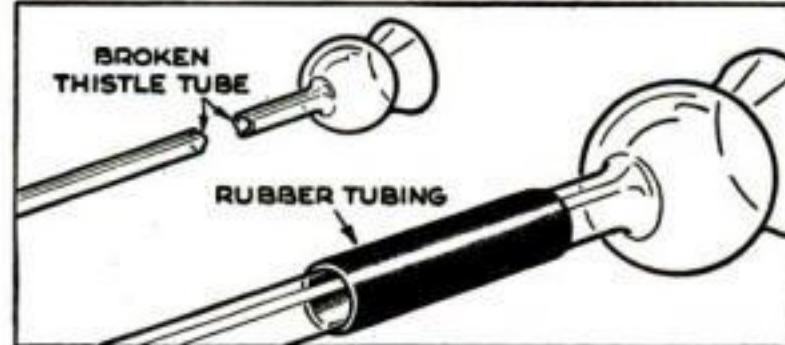
Anhydrous copper sulphate can be used

to determine whether water remains. Shake a little with some alcohol in a test tube; then let it stand half an hour. If any water is present, the sulphate will turn blue.

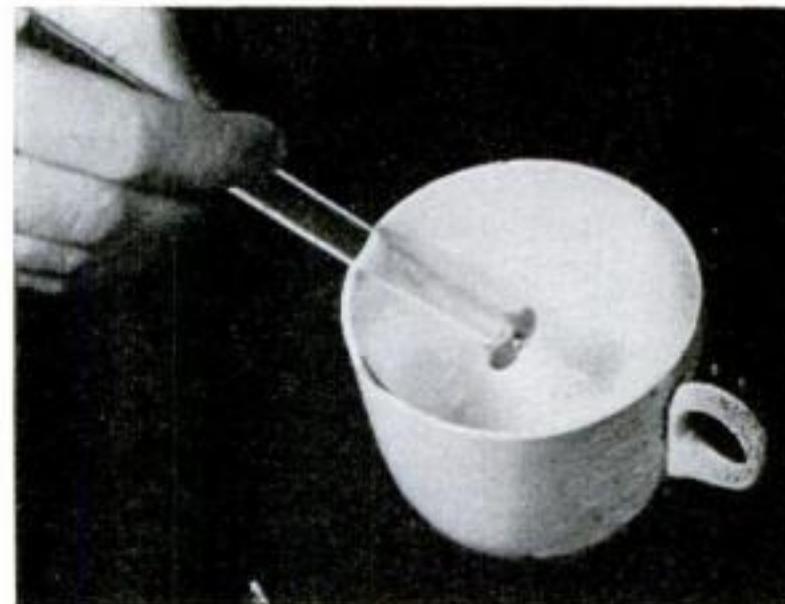
A common jellylike canned fuel is a form of alcohol solidified by a chemical change. This can be made by pouring 9 parts of denatured alcohol into 1 part of a saturated solution of calcium acetate and stirring.

Many artificial fruit and flower flavors are *esters*—compounds resulting from the reaction of alcohol with an organic acid. Ethyl acetate, a common ester, can be made by adding a mixture of 5 ml. of glacial acetic acid and 2 ml. of concentrated sulphuric acid to 5 ml. of ethyl alcohol. Heat by placing in hot water, then let it stand. In a few minutes the fruity odor of ethyl acetate will become evident.

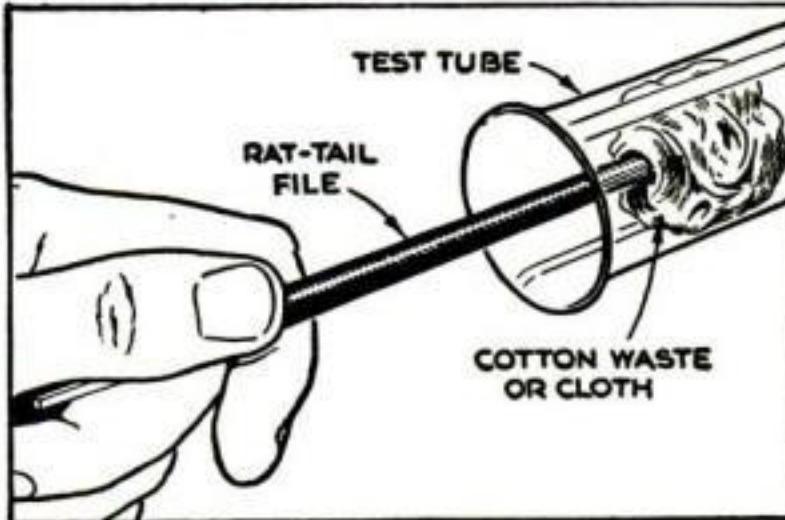
BROKEN THISTLE TUBES can be repaired by joining the sections with a piece of tight rubber tubing. For additional strength the rubber can be wound with thread and coated with nail polish. This method is especially useful when it is impossible to heat and fuse the pieces together.—MICHAEL F. MEIER.



COMPOUNDING chemicals in the home laboratory frequently calls for the use of a mortar and pestle. A coffee cup and a piece of glass towel rod, used as shown at the right, will provide a satisfactory substitute. It will be well, however, to mark the cup with a skull and crossbones so that henceforth it never will be used accidentally for its original purpose, for the traces of chemicals that remain might prove injurious. In addition, if you are using a glass rod that has been broken, the broken end should be smoothed or taped.—HERMAN KLEIN.



CLEANING glass or metal tubes, or even bottles, can be accomplished with ease by use of a rattail file and cloth or cotton waste. Push the cloth into the tube with the file. When the file is rotated it readily catches and rotates the cloth, cleaning the inside of the tube thoroughly. When the file is withdrawn, the cloth comes right along with it. I have found this idea particularly useful in cleaning out test tubes, far more efficient than other means.—RICHARD C. HARE.

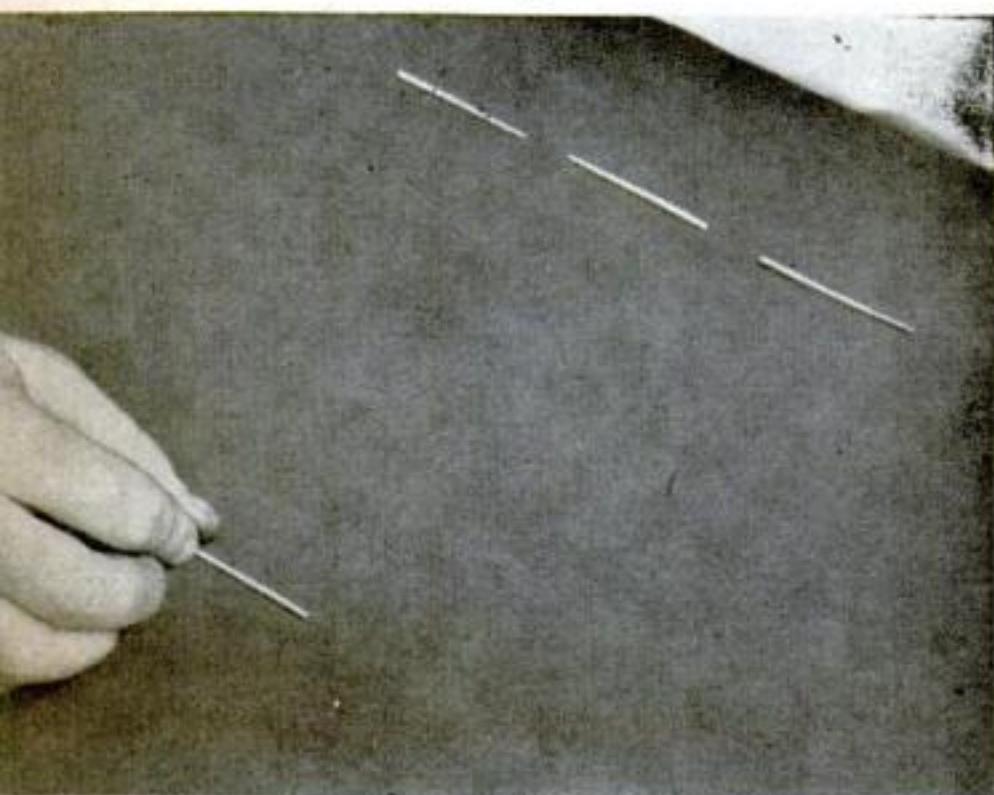


YOU CAN'T HOME EXPERIMENTS WITH



TASTE AND SMELL frequently play us false. Grandmother knew exactly what she was doing in holding her children's noses while they swallowed the castor oil, and science now recognizes the fact that the taste of many things is attributable largely to their smell. For example, if a pear is held close to the nose while an apple is being eaten, the apple will seem to taste like a pear.

SIGHT often may be unreliable because of optical illusions. Arrange three toothpicks in a line as below. Then ask someone to place a fourth so it forms part of the opposite side of an imaginary square. A ruler will show that most persons misjudge it by a good deal. The usual error is to underestimate the distance and drop the toothpick too close.



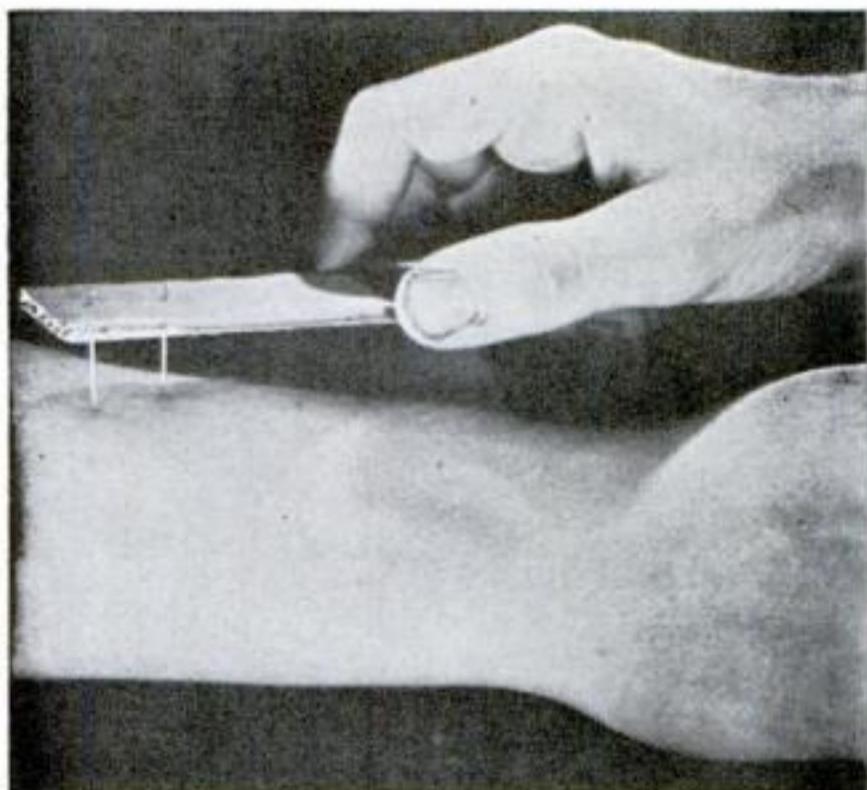
TOUCH a marble with crossed fingers as above, close your eyes—and confusion begins. Although you know there's only one marble at your fingertips, your senses try desperately to convince you there are two. This illusion, which incidentally was noted by Aristotle, results because in everyday experience pressure on the outer sides of adjoining fingers indicates two objects.

SOUND sometimes gets mixed up with the sense of touch, as this experiment will show. Rub your fingers lightly over the back of a friend's coat while vigorously brushing your own—and your friend will give you sincere thanks for brushing *him* off! The feel of your fingers combined with the sound of the brush conveys to the friend the perfect illusion that he's the one getting the brush-off.

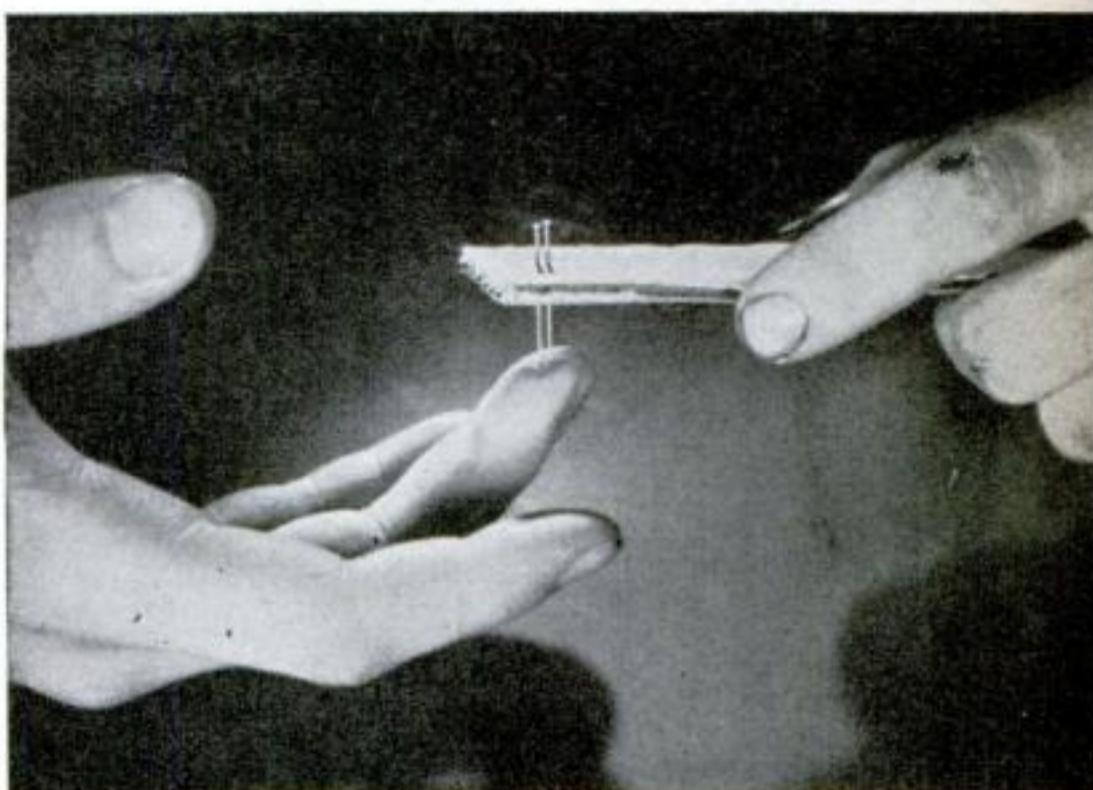


TRUST YOUR SENSES!

SENSORY PERCEPTION SHOW WE MAY OFTEN BE FOOLED



TOUCH SENSITIVITY varies on different parts of the body's surface because nerve endings are distributed in varying concentration. On the fingertips the nerve endings are closely packed, and on the lips and tongue they are still more concentrated. But on parts of the body where great sensitivity is not needed, the nerves are comparatively scattered. If you thrust two pins through a



strip of heavy cardboard about 1" apart and touch a blindfolded person on the arm, as at the left, he will say that the point of only one pin touched him. But move the pins close together as at the right and touch his fingertip and he will note immediately that there are two. On some parts of the body, the thigh for instance, pin pricks as much as 2" apart may be interpreted as one.

HOT OR COLD? What we think we feel often is governed by what we see. For instance, without the help of our eyes we may not know whether an object is hot or cold. If you are not convinced, touch a piece of ice to the back of someone's neck while in a group of smokers. The victim's angry expostulations that he was burned with a cigarette should be sufficient proof.

SOUND DIRECTION usually can be determined because the ear nearest the source receives a louder impression. But when sound reaches both ears with equal intensity from a point above, in front, or behind, the directional sense is poor. A blindfold test will show this. Snap your fingers above, in front, or back of the blindfolded person. Often he won't know the right direction.





Mark Is Painted on Saw Table to Align Work Accurately

SIGHTING along a mark on the work rarely produces accurate cutting on the circular saw, especially when the work is marked on an edge as above. But a line painted on the table, in front of and aligned with the saw blade, will show exactly where the kerf will come. It is equally useful in cutting to length, forming tenons or end rabbets, and sawing outside dado lines.

First make sure the table is properly aligned, with the grooves parallel to the blade. Then, with the blade well above the table, hold a straightedge against one side and scribe a line along the table, being careful not to bend the saw blade out of true. Repeat on the other side of the blade. Fill the space between the lines with any durable paint light enough to show plainly.

Ideally the painted line should be the exact width of the saw kerf, so for laying it out mount the blade you most commonly use.—H. W.

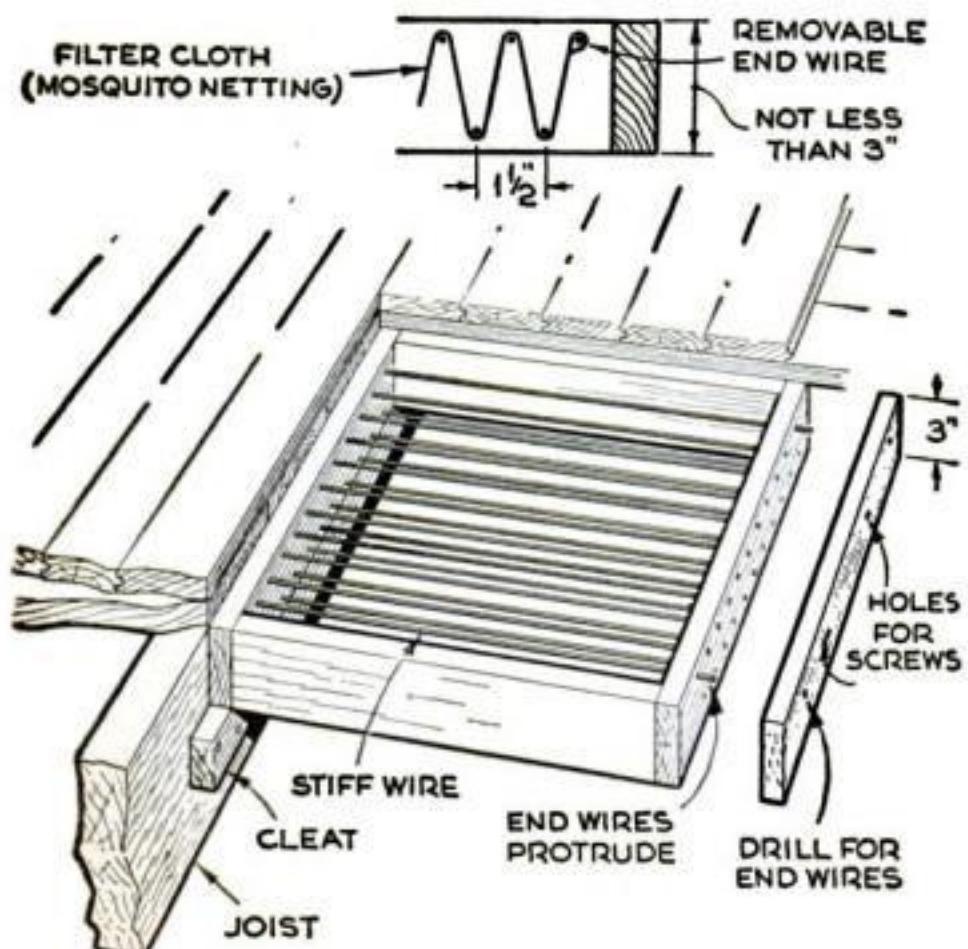
Bud Vase Made from Light Bulb

PLAIN and frosted incandescent bulbs make dainty vases for a bud or two. Large vases can be made from 200-watt bulbs. Remove the screw end and with pliers break off the thin glass stem in the center. No jagged edge will show. Cement the bulb in a glass caster cup.—BEATRICE E. REESE.



Welding Removes Broken Stud

TO DRILL out a stud broken off beneath the surface of a workpiece is troublesome, and it may necessitate rethreading the hole. With a large-diameter stud broken not far from the surface, you can sometimes add weld metal to the top of the stud, and then, after a head has been welded to the extension, unscrew the stud with a wrench.



Filter Under Warm-Air Grille Helps to Keep House Clean

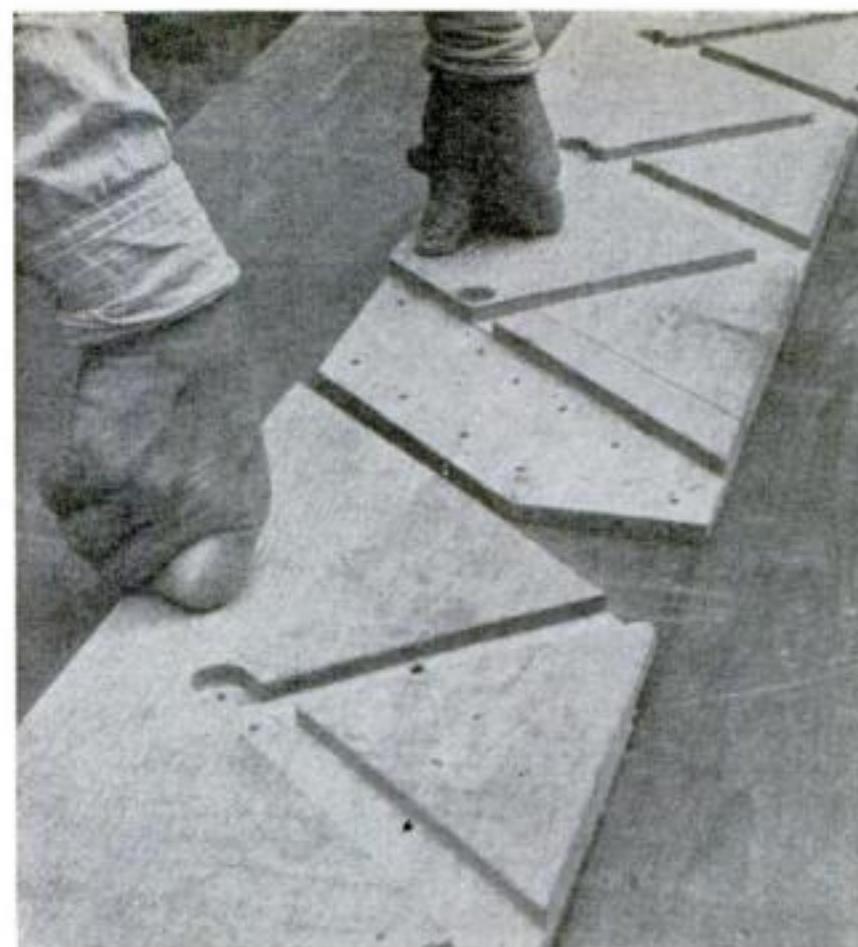
WITH a little scrap lumber, some stiff wire, and a piece of mosquito netting, you can make an effective filter for a warm-air heating register. When you remove and clean it every three or four weeks you will see how much dirt it holds back.

Cut the wire into lengths equal to the distance between joists minus the thickness of the detachable frame member. The two end wires are a little longer.

Rip the netting or an old lace curtain to suitable width and hem the ends to thread the end wires through. Then rinse out the starch and moisten with light oil, possibly cedar oil for a pleasant smell. Loop the netting over and under the other wires as in the top drawing.—GEORGE I. SMITH.

Long Stair Stringer Is Strongly Spliced with Lap Joint

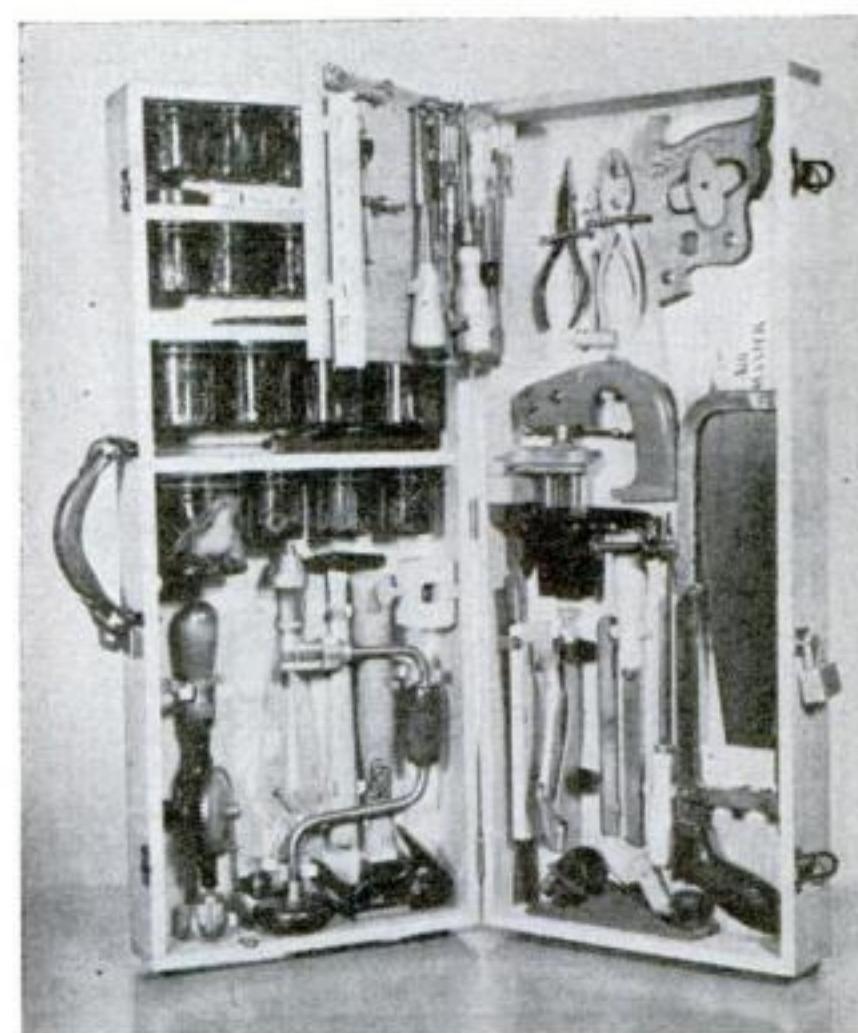
IF YOU find it necessary to splice a housed stair stringer because of a lumber shortage, you can do a strong, neat job by lap-jointing the pieces on a line with one of the tread grooves, as shown at right. Where the customary stringer thickness of $\frac{3}{4}$ " and groove depth of $\frac{3}{8}$ " are employed, the thickness of the face wing (the undercut end of the piece at the bottom of the photo) must be slightly greater than the thickness of the back wing (on the other piece) to avoid cutting away the bottom of the riser groove in the face wing. Also do not cut out the tread groove at the edge of the back wing until the pieces have been joined, for the groove material is needed as a stop against which the face wing can be butted. Join with glue and wood screws.—J. MODROCH.



Chest Affords Storage Space for Tools in Apartment

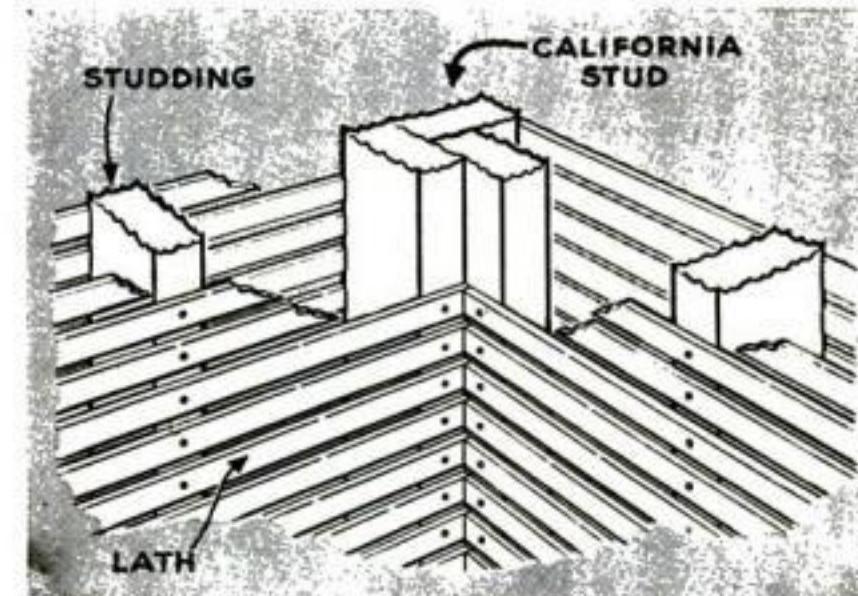
HOLDING sufficient tools to take care of routine household jobs, this chest was born of the necessity for compact storage in a cramped apartment. It measures 6" by 12" by 30", may be stowed in a small closet, and when stood on end can be slid easily from place to place on its gliders. Tools are placed so that the weight is balanced, and the closed case may be carried with comfort. All tools and supplies are easily removed and replaced.

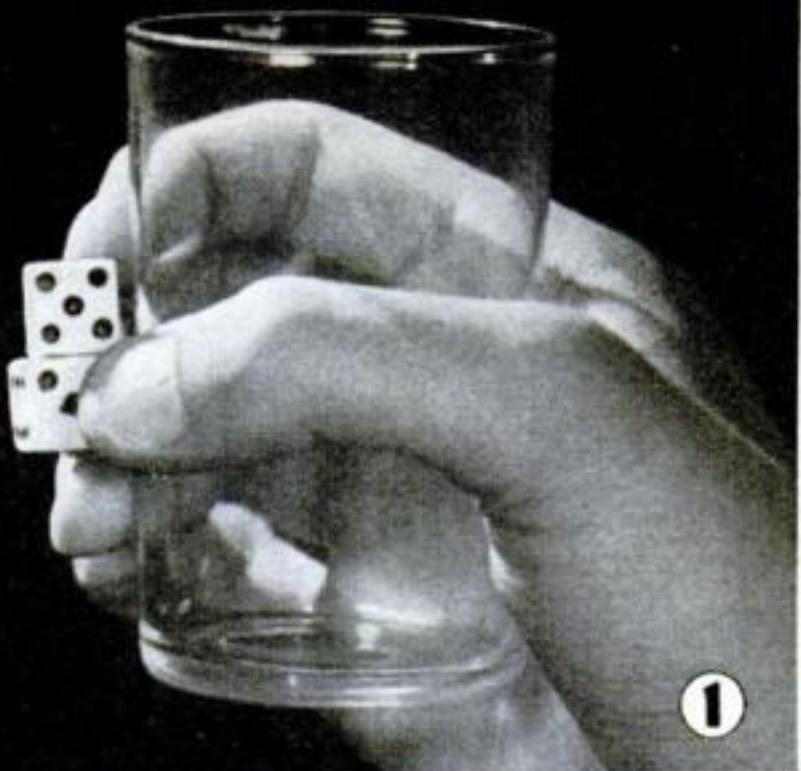
Clips bought at a hardware store, short lengths of screen-door spring, and wood turn buttons are used to hold the tools. A small swinging panel increases the tool-mounting area. Nails, screws, and other small parts are kept in small glass jars, the metal screw-on tops being fastened under a line of shelves. A grip and fasteners for the case came from an old suitcase.—R. B. LEWIS.



California Stud Requires Only Three Members at Corner

BUILDERS who like to save time and material can do both with the idea illustrated here. I don't know where it gets the name but some carpenters call it the California stud. It uses three two-by-fours instead of four, providing a saving in material of one complete length. When the three two-by-fours are nailed together, plenty of space is available for nailing, the inner laths in the corner.—FRANCIS B. JACKMAN.





1

TABLE TRICKS

1 TOSSING DICE into a glass is hardly a trick. But hold two dice and the glass in one hand, as shown above, and try getting the dice in one at a time. The first die can be caught readily; but when you try throwing the second up, the movement pops the first out of the glass. Instead drop the second, and move the glass under it.

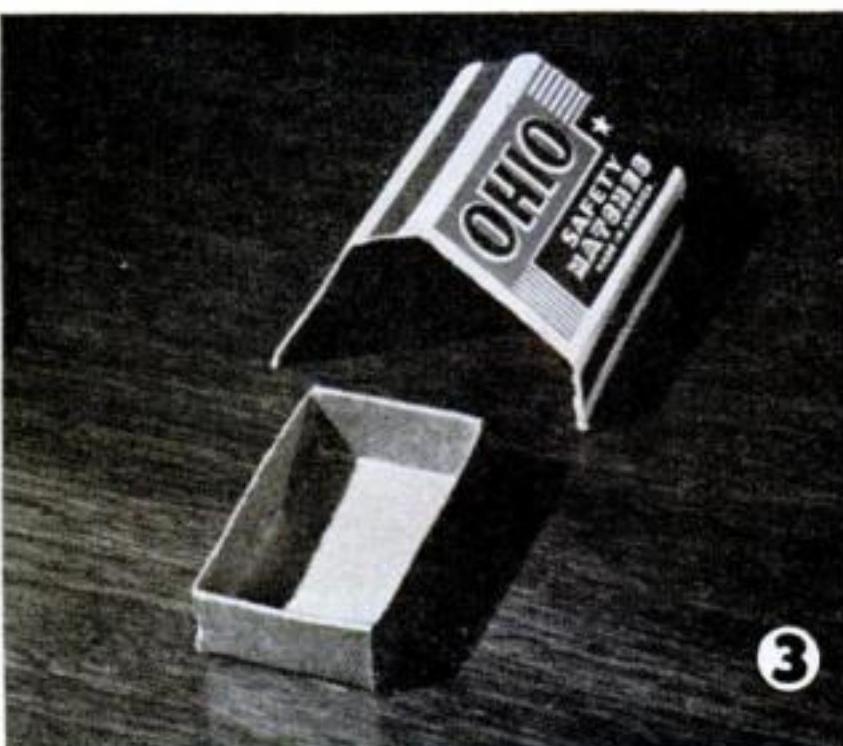
2 GRAVITY CAN BE DEFIED if you have the know-how! Close your left hand around a pencil; then grip your wrist with your right, as shown, pretending that this exerts magnetic action. Slowly open the fingers from around the pencil and then the thumb. But be sure to hold the pencil with your unseen right index finger!

3 MATCHBOX MAGIC. With the drawer on the far side of a tunnel formed from the box, challenge anyone to make the drawer come through the tunnel toward him—without touching anything. When others have given up, cup your hand behind the drawer and blow smartly into your palm. The drawer will be blown toward you.

4 RIGHT OUT OF THE HAT come cards at your command. Let the deck be shuffled and cut. Place half in a hat, cover with another hat, and shake to mix them. Then let



2



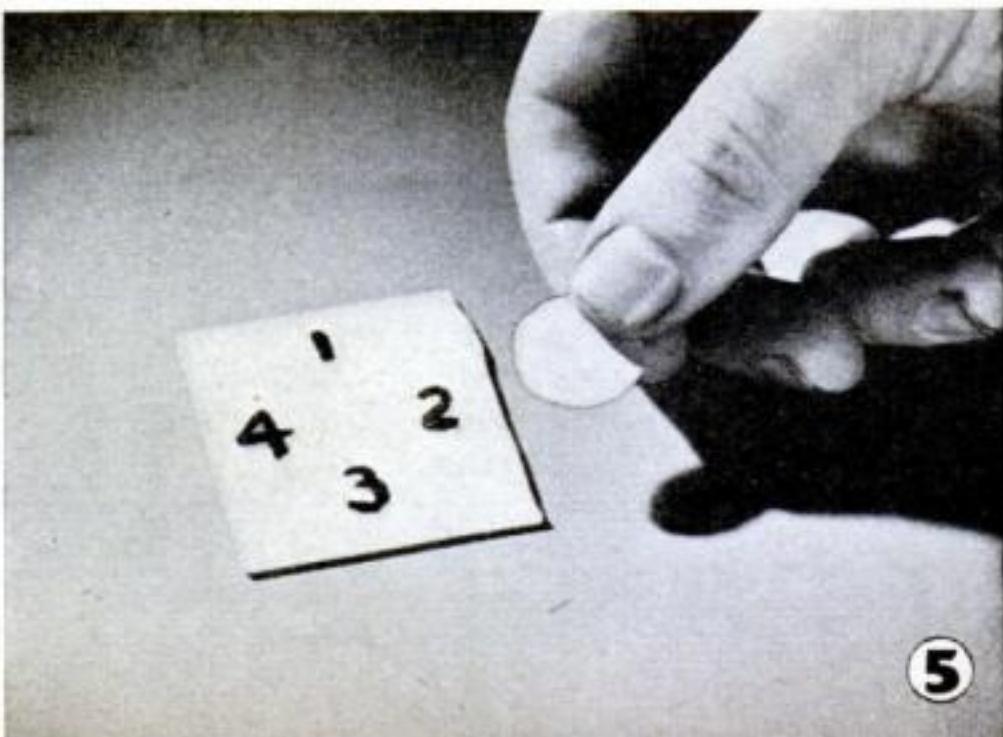
3

a friend slip three cards from the remaining half between the hats face down. Shake the hats again. You can then pick his three cards unerringly. Bend your half deck before putting it in the hat. The chosen cards, being flat, are then easily distinguished.

5 NUMBERS ON A CARD are a real puzzler. While your back is turned have someone cover for a minute or longer one number on a card like that below. Then hold the card to your forehead while you pretend to concentrate, but take a surreptitious look at it in the darkness of your cupped palms. If luminous paint was used, the number that was covered will glow less than the others, enabling you to name it.



4



5

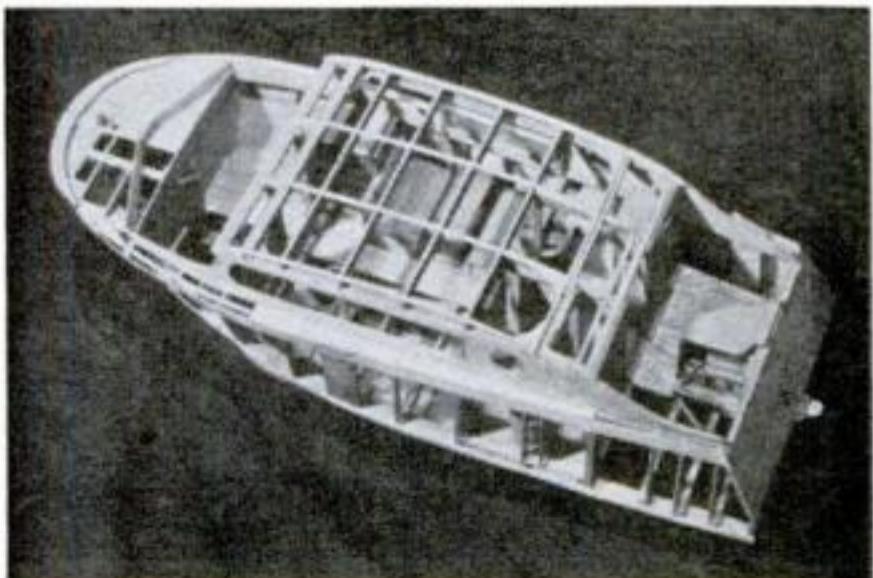


A Modelmaker Builds His Dream Boat

PREVENTED during the war from building the special 30' cabin cruiser that he planned, Louis J. Seigmann, of Newark, N. J., decided to do the next best thing. He built a carefully detailed model of his dream boat, scaled at 1" to 1', that incorporated the features he wished in the full-size craft. The construction of the model parallels that of a regular boat, except that the decks and cabin are removable so that the interior can be inspected. Even the galley is fully equipped with tiny dishes and miniature cooking utensils.

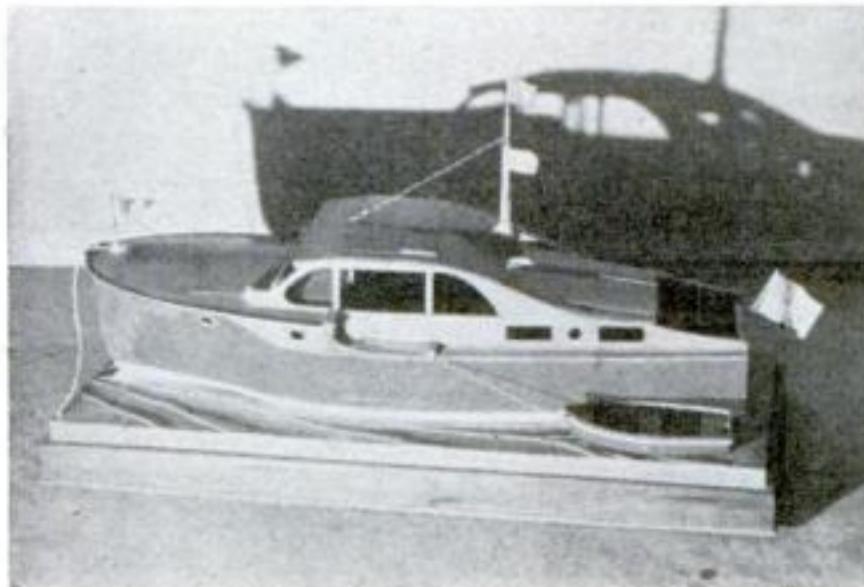
Now that materials are about to become available, Seigmann plans to construct the full-size *Shangri-La*, profiting by his experience with the small prototype to build a cruiser that meets all of his desires.

Meticulous detail is apparent in the scale model. The engine installation is in the after cockpit.



Seigmann adds the final touch to a part. Cabin and decks are removable for access to the inside.

All flags fly on the completed 1" to 1' model as they will on the 30' *Shangri-La* that will follow.



Vertical Railroad

(Continued from page 124)

Medical research has shown that it's not speed that produces queasiness, but the rate of acceleration or deceleration. The only physiological restriction on speed is the fact that, for the average person, descents of more than 600 feet, at a speed of 1,500 feet per minute, are liable to be uncomfortable because of the rapid change in atmospheric pressure.

The past of our hard-working little indoor railroads is almost as fascinating as their present and future. Somebody, believed to have been Chinese, had the simple but extremely useful notion long ago that by wrapping some rope around a drum and twisting the drum with a lever he could raise water from a well with less effort. In one sense, this lazy fellow made the Empire State Building possible, because a bucket in a well and a car that can whisk you up 80 stories differ mainly in operating refinements.

Egyptian engineers devised windlass derricks to save wear on slaves employed on such public-works projects as pyramids. In one of Nero's palaces, there are indications of three vertical shaftways, and they can't all have been laundry chutes. In the seventeenth century a Flying Chair, in which a passenger moved himself by hauling on a rope as in a dumb-waiter, was used at the French court until "a serious mishap occurred to the King's daughter, as a result of which the Flying Chair fell into disfavor."

Hand-powered freight lifts appeared in England and America in the nineteenth century. In its more refined form, a man-powered freight elevator consisted of a platform running between vertical rails and attached by ropes to a drum above. Counterweights balanced the platform and average load. Geared to the drum was a large pulley from which an endless loop of rope dropped down the shaft past the platform. If a man hauled on this rope, he could lift a ton or so of freight without heart dilation.

Steam engines were added to these rudimentary elevators in the 1850's, and the Astor House installed a passenger lift that must have dazzled New Yorkers. A steam engine was connected to the hoisting drum by two belts, one rigged in the conventional manner and the other crossed into a figure eight. The second belt was used to give reverse motion, powering the elevator in either direction. Levers moved by a rope permitted the operator to select either belt. This elevator occasionally reached a speed of 50 feet per minute, or .57 m.p.h., a fair

approximation of a hands-and-knees pace.

One visionary produced a machine whose specifications called for a giant screw to run vertically through the building, with a car acting as a nut on the screw. Another seer replaced the counterweight on his elevator with a huge water tank that could be filled or dumped at will. The "water-bucket elevator" was capable of high speed—practically a free fall—but never became popular.

If the car of an early steam elevator was overloaded at an upper floor, the extra weight might force the engine backward, pumping air into the boiler and depositing the passengers abruptly at the bottom. Gearing that permitted no unpowered motion stopped this tendency. Soon the engine was directly connected to the hoisting mechanism, which ended the jerky uncertainty of belts, with directional control provided by reversing the engine.

By the seventies steam elevators were smooth and fairly efficient. Some ran 500 feet a minute, a fair speed today, and skilled operators were needed to make accurate, gentle landings. But steam found a relentless competitor in hydraulic elevators.

These were amazingly simple in theory. Water pressure moved a piston in a cylinder and the piston moved the car. Sometimes the cylinder was placed on its side in the basement and connected by a block-and-tackle rig to the counterbalanced car, and in other installations the cylinder was vertical. A variant design, known as the plunger-lift elevator, put the cylinder directly under the car, like the greasing lift in your gasoline station. This required a hole as far beneath the basement as the highest story extended above. On very high rises the plunger had a regrettable tendency toward buckling if it were not made almost prohibitively heavy. Occasionally, too, hydraulic elevators would coast upward beyond pressure when a stop was made after a fast rise, the plunger overtraveling and dropping back on the water with a jolt sufficient to show the whites of a passenger's eyes.

Progressively higher operating pressures became necessary in the race with steam: 700 pounds per square inch wasn't uncommon. As a result, maintenance men were forever struggling with leaking glands and hissing joints. One handbook of the period mentions an effort to use the discharged water in the building's sanitation system, but sudden variations in pressure made this

difficult. Probably the favorite whim of errant hydraulic elevators was known to the trade as "creeping." Instead of standing still, a car having this trait would wander off along the shaft unless watched closely.

Electric power was used in 1884, but did not become a real competitor for several years. It was more efficient because no stand-by power was required. Nearly all the passenger elevators built nowadays are electric.

A better hoisting principle was developed about the beginning of this century that was well suited to tall buildings. Under the old system the height of travel was limited by the drum diameter and by the width of the drum that could project into the hoistway. The "traction system," introduced in 1903, replaced the drum with a sheave, or multiple-groove pulley, mounted on the shaft of a slow-speed motor. Hoisting cables now run over the sheave and a secondary sheave, and then run off to the counterweight, thus leaving only a small, constant amount of

cable at the top. One feature of the system is that if for any reason the motor should fail to stop, either the car or the counterweight will rest at the bottom of the shaft, releasing tension from the cables and allowing the sheave to rotate harmlessly. With a drum, the same mishap might pull the car or counterweight into the overhead beams, jerk out the cables, and drop the load.

A limit to the height of buildings, more restrictive than the strength of steel, is the number of elevators that can be installed and still leave an economically efficient building. An office-building architect may be confronted by the probability that 35 percent of the building's population will arrive within 20 minutes in the morning and depart within 15 minutes in the evening. Traffic men are likely to consider the morning peak a more difficult problem because congestion occurs in the lobby rather than on scattered floors. Presumably, it is better to have impatient people spread over the building instead of massed in the lobby.

Collision at Sea

(Continued from page 129)

tion and avoidance of collisions. He had an idea. He talked it over with his junior officers. They liked it. It was this: Set up a school using synthetic training. Simulate with realism all the equipment used in conning a ship. Reproduce actual sounds. Study past collisions and, from the causes, evolve a uniform emergency shiphandling procedure so standardized that skippers of any two ships would know in advance what maneuver the other was most likely to execute. Simulate collision situations and train officers to think in split seconds, but in terms of comfortable safety margins.

Back in port at Pearl Harbor, Lott sold the idea, and he was named Officer-in-Charge. Ten days later he opened his first classroom.

"It was pretty crude," he recalls. "All equipment was handmade of stuff we pulled off scrap heaps, and there wasn't much equipment even at that. What we didn't have, we invented. But our student officers were patient. We passed out questionnaires soliciting criticism, and got plenty. As a result, the course, as it stands now, is the work of thousands of officers."

There isn't a single lecture in the curriculum. "Fast-moving as a Broadway show, and almost as interesting" was Lott's goal. The course quickly gained an overwhelming acceptance. Even officers on short shore leave after months at sea gave up priceless hours to attend. Six months after the first class, collision rates in the Pacific

began to drop. At the war's end, collisions had been virtually eliminated. Lott was installing new schools on the mainland for postwar use.

How was it done? The magic was the realism with which Lott imbued the course. *The secret was making young officers realize that they had to reckon with the speed and course of the other ship, as well as of their own.*

For instance, one ship is steaming north, another ship southeast, both making 15 knots. When these ships are still 1,850 yards (more than a mile) apart, their courses will intersect and they will collide in just two minutes—120 seconds—if some action is not taken. Their relative speed (the combined speed at which they are closing on each other), called range rate by the Navy, is high, much higher than many inexperienced officers would realize. AND the time left to act is short!

Another example: One ship is heading due east, another due north, both making 34 knots. When they are 1,655 yards apart, just 60 seconds are left before the crash. However, at the 1,655-yard range, if the eastbound ship executes a left turn, it will miss the other ship by 750 yards; if it turns right, it will miss by 550 yards.

The curriculum at the Emergency Ship-handling Schools established 500 yards as the minimum safety margin to be considered for small vessels, and 1,000 yards for large. This Lott and his colleagues

pounded, drilled, and hammered into the student officers' heads. These same heads were buzzing after the intensive course, which winds up with these final exams:

An entire day is spent in making simulated runs. First, daytime runs are simulated; then night runs, during which the "ships" are followed by their lights. Then come the difficult poor-visibility runs, in which radar must be used almost exclusively.

In all of these runs, actual collision cases are reproduced and the conning officers of the two ships are thrown into sudden and imminent "danger" by the instructor, who manipulates the shiphandling gear to reproduce the error that was made in the original collision. This might have been a TBS (Talk-Between-Ships) radio failure, causing one ship to fail to receive a turn signal; a junior officer turning the wrong way in formation, with the captain lacking time to get up to the bridge in time to avoid the collision; or a rudder casualty suddenly throwing two ships onto a collision course.

During these runs, every situation and condition is simulated with great realism. The conning officers are on their "bridges," booth-like enclosures from which they cannot see the junior officers of the deck. These JOODs, equipped with all the aids they have on shipboard, sight on model ships, and relay bearings and ranges to the conning officers on the ships' intercommunication system. They must physically carry out every action. If the captain should be called, the student must actually press the button, and the buzzer sounds. This auditory realism is carried to the point of dropping a pile of scrap iron on a steel floor in the next room at the instant of a collision.

On the "bridge" the captain has his steersman, ship's telegraph (by which orders are transmitted to the engine room), radio, radar scope, and ship's intercom. He "cons" through binoculars that are reversed to create the illusion of distance.

After each run, action taken by the student officers is evaluated, and mistakes are pointed out. JOs are reminded forcibly that the captain would rather lose his sleep than his ship.

Occasionally, an officer encrusted with years of sea experience dropped in at the school to snort his disbelief of the need for any kind of shiphandling procedure in an emergency. Having conned by the seat of his pants for years, he'd be damned, sir, if he needed any newfangled ideas to help him. Lott's gang had a cure for that type. Would the captain care to "con" a case? The captain couldn't very gracefully refuse. So they would give him a really tough collision case that had actually occurred—

an end-on case where both vessels were approaching at a relative speed of 60 knots, a situation in which the slightest hesitation or misstep on the part of either captain would make a collision inevitable. When the "crash" occurred, the boys in the back room would let go with the scrap iron. After one treatment, even the crustiest sea dog calmed down considerably.

One senior officer went through the course, conning his ship beautifully out of collision after collision. Afterwards, he made himself known to Lott as the skipper of one of the ships in a collision which had been re-created in the course. He said he had been sleeping when the collision occurred, and because his junior officer hadn't recognized the danger signs in time he had not been called to the bridge.

The new training has tremendous implications for peacetime merchant fleets, as well as for the Navy. Lott is planning a course which will prove that the new art is yet in its infancy.

He is drawing plans for an auditorium-size classroom where a dozen or more ships can be conned simultaneously from enclosed bridges, with results visible on a screen at the front of the room. Between the bridges and the screen will be seats for a large number of students. Behind and above the bridges will be a bank of projectors, each of which will throw on the screen the movements of one ship, as the skippers issue their orders. Inside two of the bridges, each captain will have a simulated radar scope on which he can watch the movements of all the other ships, with his ship indicated in the center. Thus, involved convoy and task-force problems can be worked out. The equipment will be electronically operated, and with it Lott hopes to simulate every conceivable situation at sea. His postwar aims are:

1—To have every prospective deck officer go through the school and pass a standard shiphandling test.

2—To have every shipandler take a shiphandling test every four years, and to go back to school if he fails.

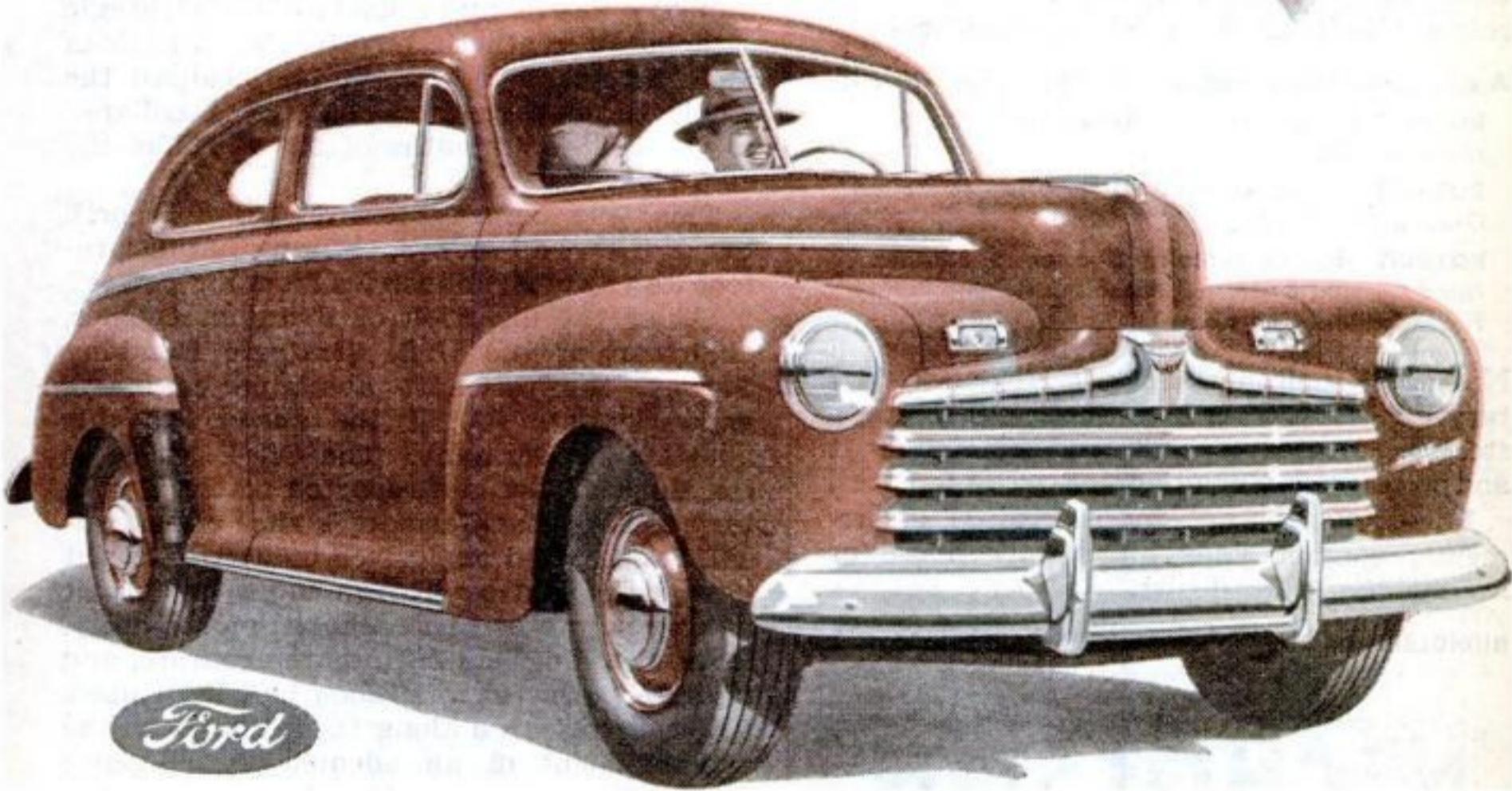
**Subscribers in the armed services
who notify us of change of address
are requested to give us the key
symbols appearing on the wrapper
in which the magazine is received.**

*And its styling
will stay smart!*

Fresh, eager, youthful—the new 1946 Ford is the smartest Ford ever built. From bright, massive grille to colorful, two-tone interiors—it's every inch a beauty . . . Advanced in style—and in comfort, performance and economy, too. Here's a car with new multi-leaf springing for a smooth, level ride. A car with new hydraulic brakes—extra-large and self-centering—for quick, smooth, quiet stops. And here's a car with new stepped-up power—plus new over-all economy. Two great engines to choose from: the V-8, now increased from 90 to 100 horsepower—the 90 horsepower Six . . . See this smart new 1946 Ford at your dealer's now.

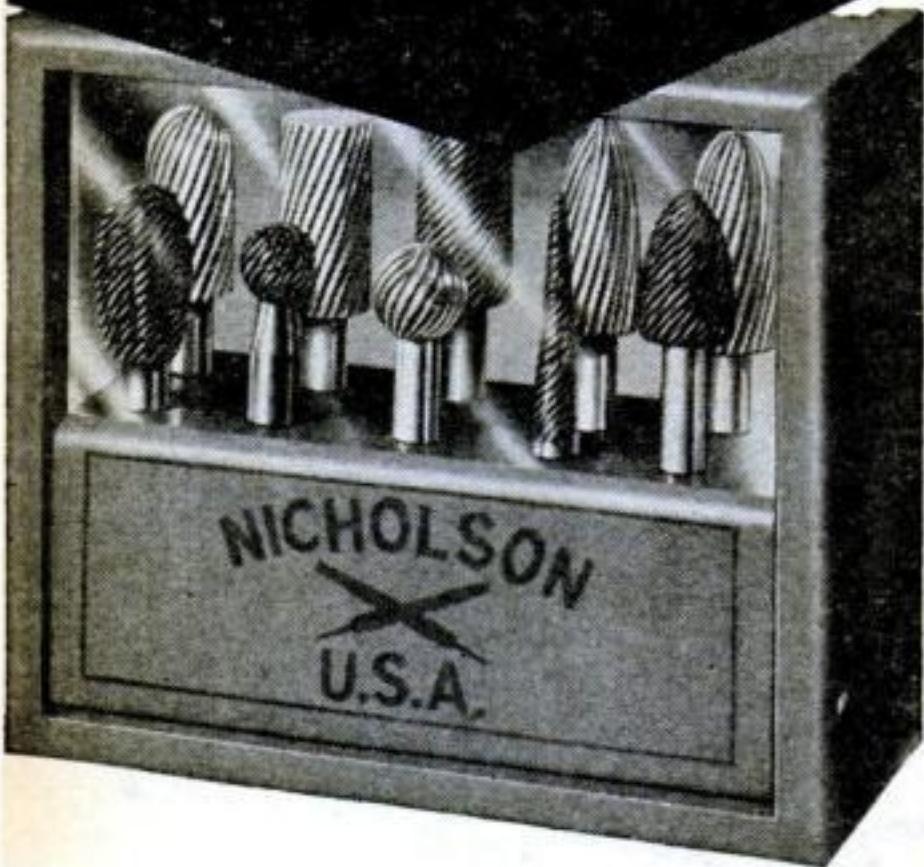
FORD MOTOR COMPANY

Tune in . . . THE FORD SHOW . . . CBS, Tuesdays,
10-10:30 P.M., E.S.T. THE FORD SUNDAY EVENING
HOUR . . . ABC, Sundays, 8-9 P.M., E.S.T.



There's a Ford in your future!

ROTAKIT



PRIDE OF THE INDUSTRIAL OR HOME CRAFTSMAN

sequence to the widening use of rotary files or "burs." And from inherent pride in good tools, every diligent user likes to have his rotary files in kit form. Nicholson offers—

A choice of three popular ROTAKIT assortments

ROTAKIT No. 20 contains 10 assorted Nicholson Hand Cut Rotary Files.

ROTAKIT No. 30 contains 10 assorted Nicholson Ground Rotary Files.

ROTAKIT No. 40 contains 5 assorted Nicholson Hand Cut and 5 assorted Nicholson Ground Rotary Files (as illustrated above).

Nicholson guarantees every Nicholson Rotary File made from high-quality, high-speed steel; keen, accurate cut; true-centered shaft and perfect radius at all cutting circumferences.

For ROTAKIT, or any individual assortments, contact your mill-supply house or leading hardware dealer.

NICHOLSON FILE CO., 19 ACORN ST., PROVIDENCE 1, R. I.
(In Canada, Port Hope, Ont.)

NICHOLSON
ROTARY FILES
(Hand Cut and Ground)
FOR EVERY PURPOSE

NICHOLSON

U.S.A.

The Rise and Fall Of a Chemical Empire

(Continued from page 69)

had even been put on 50 tanks by V-E Day.

High explosives simultaneously became so scarce that thousands of shell cases were never filled, and rock salt comprised up to 70 percent of the contents of others. Such shells boosted the morale of retreating German troops by making loud noises, but were only about 30 percent as effective as properly filled shells. Nitrogen intended for use as fertilizer was diverted to munitions, but even so there was not enough. Antiaircraft ammunition became so hard to get, according to General von Axthelm of the Flak Artillery, that battery commanders were told never to fire at an enemy airplane unless, first, they were sure it was going to attack the target they were supposed to defend and, second, they felt sure they could hit it.

"In modern war," according to no less an authority than Major General Henrici, the German Army's Chief of Ordnance, "a country's ability to produce munitions decides victory or defeat. The destruction or crippling of the munitions industry is the key to victory."

The destruction of Germany's munitions industry was a by-product of the strategic attacks on synthetic oil targets. American and British air power, in fact, caused the whole German chemical empire to collapse in the last few months of the war like the One Hoss Shay.

This was before the first atomic bomb burst. How, nowadays, can any nation protect its vital war industries from air power?

Under the direction of Franklin D'Olier, chairman of the U. S. Strategic Bombing Survey, the foremost available engineers and scientists sought the answer to this question in Germany. The Oil Division of the Survey now has reported to the Secretary of War that Germany's vital oil, chemical, rubber, and explosives industries might have been destroyed even more quickly if aiming points had been chosen more wisely, if the bombing had been more accurate, and if more powerful munitions had been used. Vigorous research along these lines, and the establishment of an adequate intelligence agency is recommended by these authorities.

Aerial and passive defenses far superior to those that Germany had would still leave American industries vulnerable, their report concludes. The best defense is the prevention of attacks.



Cars must Start...no matter how cold

You know how difficult it is to start your engine on a bitter cold day...

Time and again you've ground your battery away, and waited and waited for a service car.

Casite is the *guaranteed* answer to winter starting. It retards congealing of oil, lets the engine spin over rapidly—and start—no matter how cold. Millions of car owners know that cars start quicker with Casite.

Casite is sold by service stations, car dealers and garages in every community. Put Casite in your crankcase oil now, and keep it there—for quick starting in winter—for better and smoother performance all-year-round.

CASITE

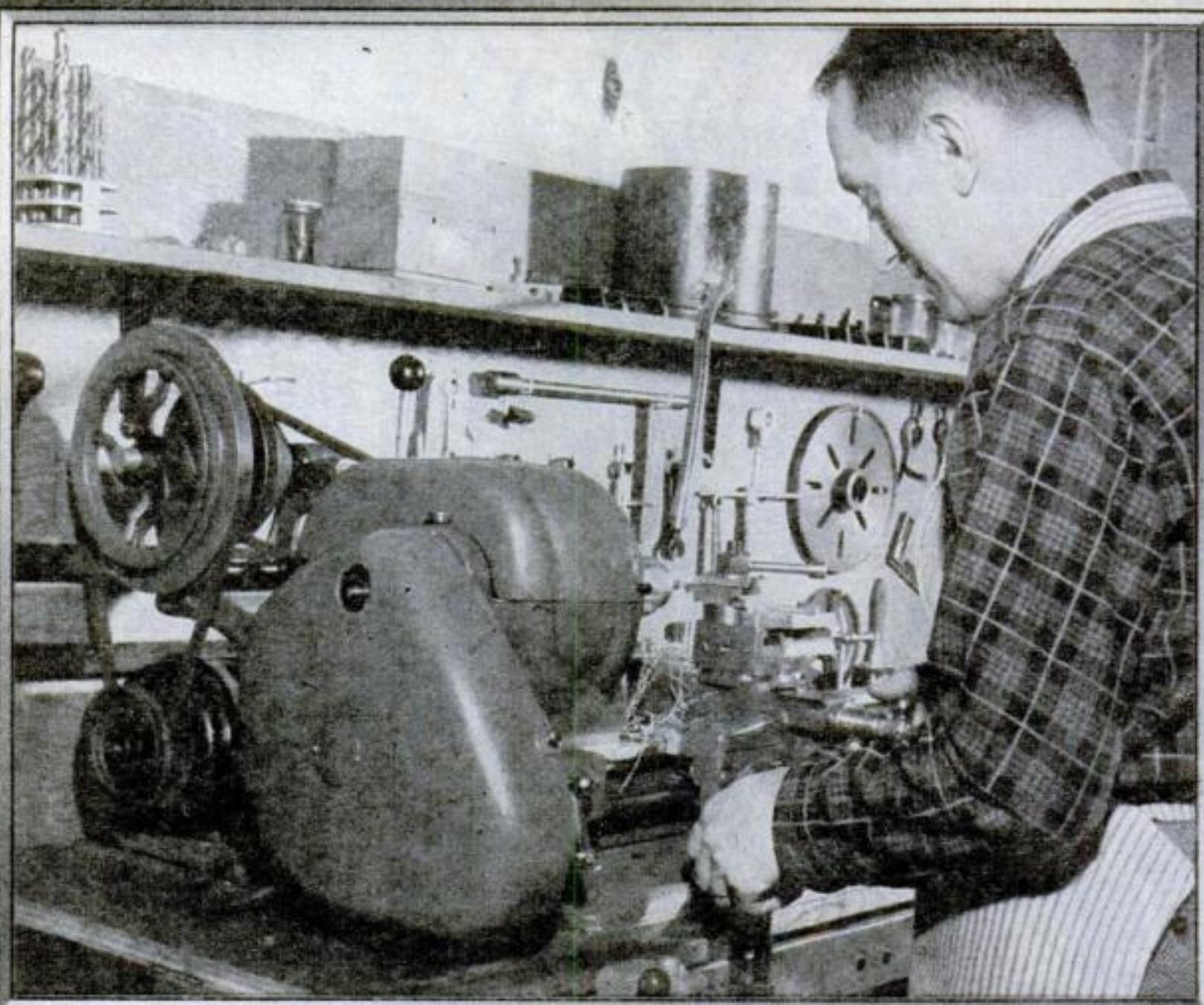


THE CASITE CORPORATION • HASTINGS, MICHIGAN

Quick Starting in Winter Weather or double-your-money-back

GUARANTEE—We guarantee that any motor capable of being started in a warm room will start promptly in the coldest weather when Casite is added to the crankcase according to instructions. If your car fails to start quickly, you get double-your-money-back by filling out guarantee certificate and mailing it to The Casite Corporation, Hastings, Michigan. Maximum refund is \$1.30 per pint, twice the nationally advertised price of Casite.

65¢ A PINT



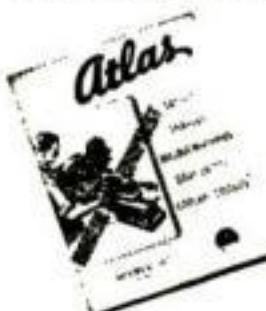
Portrait of a **HAPPY MAN!**

Relaxation and recreation to the hum of busy tools . . . making useful things for home or business . . . making quick repairs to home equipment — you're lucky if you have such a practical hobby!

Atlas tools will be available soon to help you equip your shop — at exceptionally low cost — for every project you want to undertake. They will give you the precision you need for close tolerance work — the strength required for heavy cuts. They are tools designed in every way to help you make the

most of your mechanical skill and ability on useful home projects.

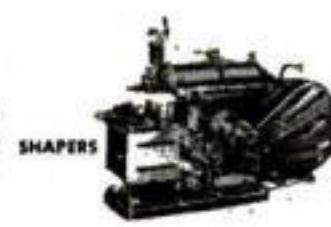
Ask your distributor to let you know when you can see and operate Atlas tools in his showroom.

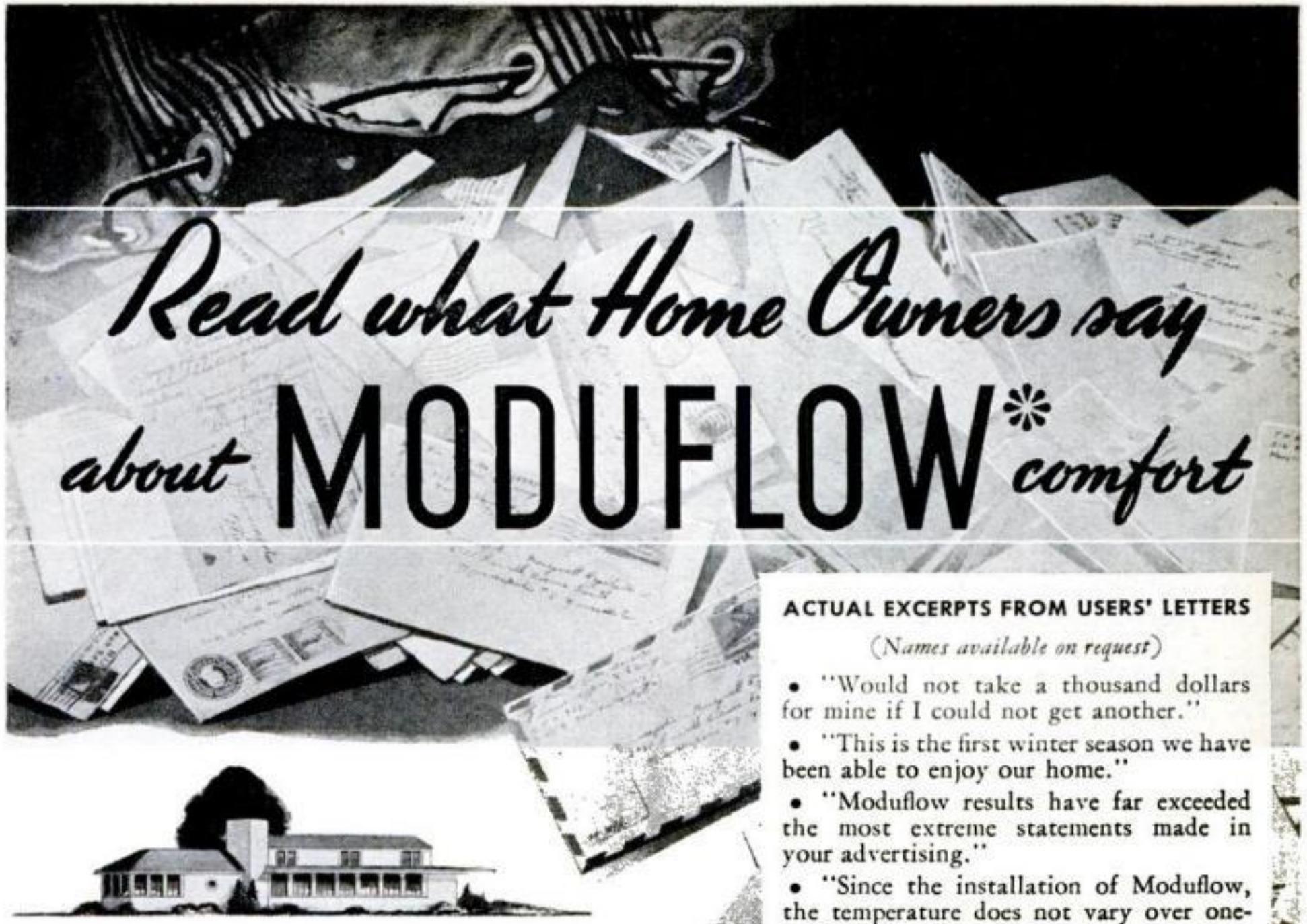


SEND FOR FREE CATALOG

You can get a preview of what to expect by sending for this new 64-page Atlas catalog. Hundreds of illustrations of special tools and operating views. Write for your copy today. Atlas Press Company, 155 N. Pitcher St., Kalamazoo 13D, Michigan.

Atlas 4 TOOL TEAM





Read what Home Owners say about MODUFLOW* comfort

During the past two years, Honeywell's remarkable new MODUFLOW Control System has been installed in thousands of homes. Hundreds of enthusiastic letters have poured in telling about the amazing improvement in heating comfort.

Here are some typical quotations taken from a few of these letters. They stamp Moduflow as the greatest advance in heating comfort since the invention of automatic controls.

FOR YOUR PRESENT HOME

Best news of all is that Moduflow can be easily and inexpensively installed in your present automatic heating plant. You don't have to wait until you remodel or build a new home.

FOR YOUR NEW HOME

If you are planning to build, make sure that your new home is *really modern* with a Moduflow Control System. Get the complete story of Moduflow without delay. Mail the coupon for your free copy of "Heating and Air Conditioning the Postwar Home".

* Moduflow is the name of Honeywell's newest heating control system for homes. It means heat modulated to just the right comfort temperature, with a uniform, continuous flow. Moduflow is a heating control system — not a complete heating plant. It can be installed in any type of automatic heating plant, whether warm air, hot water or steam.

Tomorrow's Apartment will have Personalized Heat Control . . . with Moduflow

ACTUAL EXCERPTS FROM USERS' LETTERS

(Names available on request)

- "Would not take a thousand dollars for mine if I could not get another."
- "This is the first winter season we have been able to enjoy our home."
- "Moduflow results have far exceeded the most extreme statements made in your advertising."
- "Since the installation of Moduflow, the temperature does not vary over one-half a degree."
- "In effect, Moduflow has added a room to our home during the heating season."
- "Next to the purchase of war bonds, I consider the purchase I made from you of a Moduflow control system as my best buy."
- "Since our new Moduflow system was installed, we have enjoyed a more comfortable home than we thought possible."
- "We are getting steady, even temperature at all times all over the house. It is the last word in house heating."
- "Since Moduflow has been installed the same floors are warm enough to allow the baby to play on them, and we are able to set our thermostat much lower."
- "I am delighted with Moduflow and take pleasure in recommending it as being the perfect heat control system."

SEND FOR THIS BOOK

Minneapolis-Honeywell Reg. Co.
2760 Fourth Avenue South
Minneapolis 8, Minnesota

Please send my free copy of "Heating
and Air Conditioning the Postwar Home"

Name

Address

City State



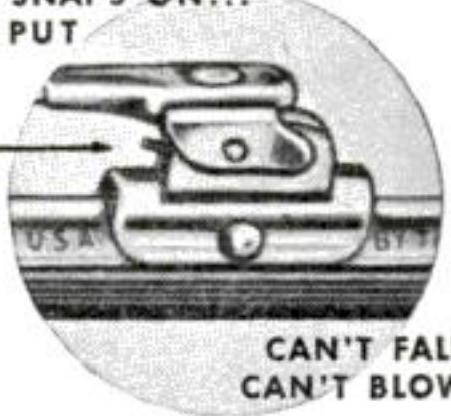
ANCO RAIN-MASTER

"Dead-Locker"

**WINDSHIELD WIPER
ARMS and BLADES**

**BLADE SNAPS ON...
STAYS PUT**

**FINGER-
TIP
RELEASE**



**CAN'T FALL OFF
CAN'T BLOW OFF**

(A war-born invention—by ANCO—first)
(for military aircraft—now for your car.)

DON'T SHOOT YOUR GAS-PUMP MAN!

He's doing the best he can. Sure, he knows how dangerous it is for you to drive your car... in stormy weather... with your dull old windshield wipers that smear and smear. He'd gladly put on for you quickly a pair of keen new ANCO RAIN-MASTER Wiper Blades and Arms. He has them—Newest Models! But he forgets to remind you? Too busy? You can't shoot him for that!



**PATENTS
MAKE JOBS**

After all, it's *your* car to protect. So you remind him. Get RAIN-MASTERS... patented features... original equipment on many makes of high grade cars and trucks... used in war—on our fighting tanks and trucks and ships and bombers too... because ANCO RAIN-MASTERS clean quicker, clean cleaner... last longer. May save you a costly smashup.

Ask for RAIN-MASTER Windshield Wiper Arms and Blades next time you buy gas.

THE ANDERSON COMPANY

Established 1918

GARY, INDIANA

Why Jap Air Force Died

(Continued from page 91)

called the Shusui, to be powered with a copy of the Walther used in the ME-163, the first German rocket plane.

In another development, a jet coupled with an internal combustion engine was used in a new suicide plane, the Baka 22. A four-cylinder Hatsu-kaze, inverted in-line, air-cooled engine drove a single-stage compressor to provide the power for these specially built Kamikaze planes, of which the Japs had close to 100 assemblies in construction.

Probably their most outstanding achievement had been in the development of an axial-flow, turbo-jet engine with which they planned to power a conventional-structure interceptor called the Kikka. The first test model of the Kikka had gone in the drink in August when the pilot pulled the throttle on takeoff instead of pouring on full power. The Japs were also planning to use this engine in a new suicider designated as the Baka 43, which had reached the mock-up stage.

The pulse jet was the fourth type under development, and of this our intelligence officers had learned little when I left Japan. They knew only that the Japs had gone as far as two small test models and these had not yet been analyzed.

Besides pushing jet propulsion in their frantic, last-minute defense effort the Japs were also converting bombers into night fighters and interceptors. They were modifying all possible planes to carry inclined fixed guns which were to shoot from the most favorable position, beneath and slightly to the rear of the intended victim. Every device the designers could dream up was being used to make up for the mistakes which had put the Japs so far behind us in fighter types that virtually their whole naval fleet had been lost.

One of these mistakes was the failure to set up a good pilot-training and rotation system along the lines of our own. Japanese flying admirals, asked to explain the failure of fighter squadrons to use teamwork tactics, always gave the same answer: "bad interplane communications," and "not enough good pilots." The Japs, after they lost most of their best fliers in the battles of Midway, Coral Sea, and the eastern Solomons, never did catch up. After each battle they used to have to pull back their first-run fliers for a sort of general re-training program.

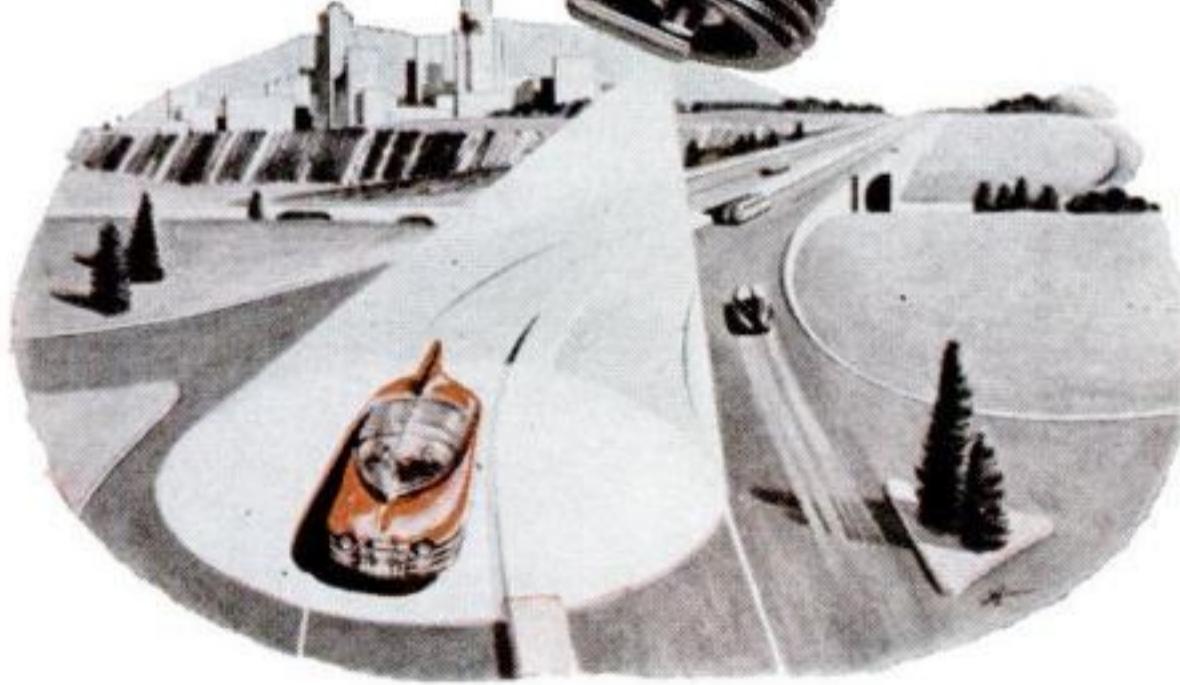
Wartime aviation in Japan worked under a continuous handicap: lack of cooperation between the Army (*Continued on page 218*)

Type of 6-engine Clipper Pan American World Airways will place in service in the future.



New Horizons...

IN SPARK PLUG PERFORMANCE!

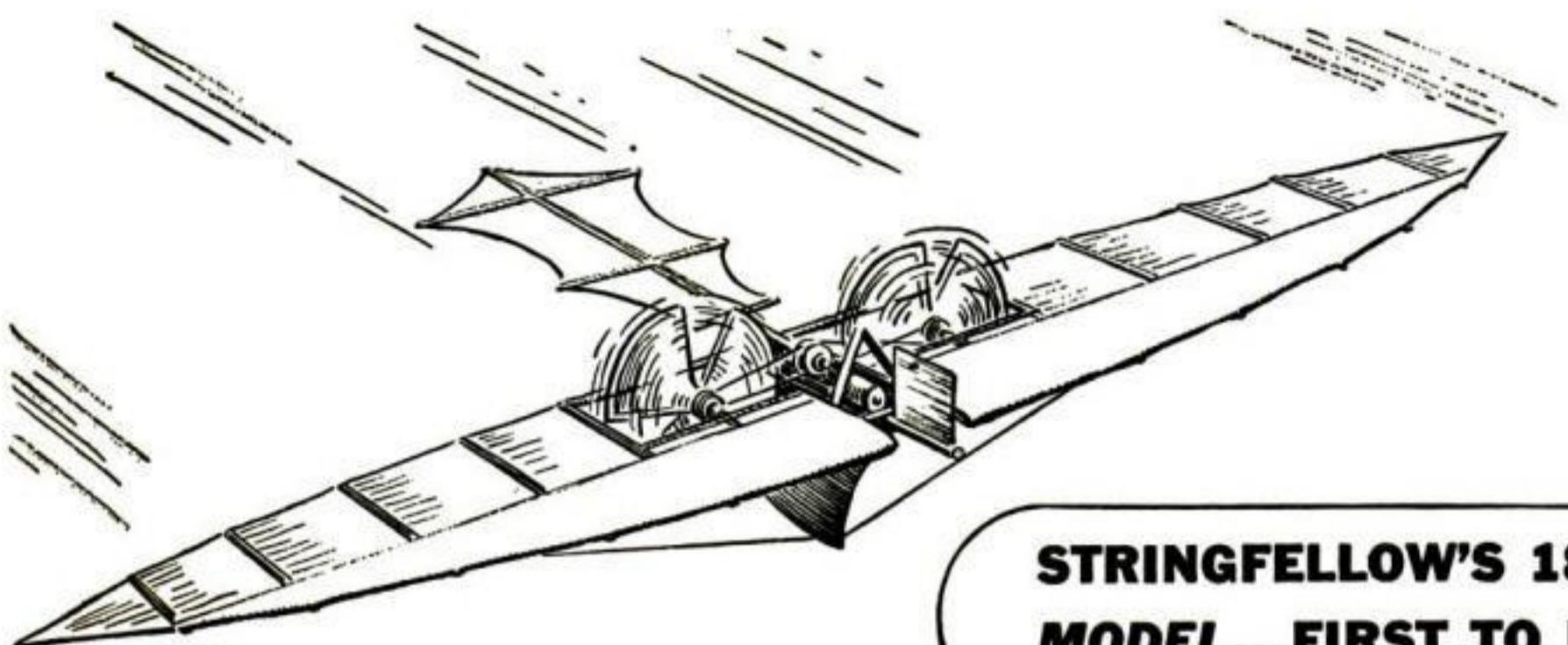


Wartime necessity produced technological advances in Champion Spark Plugs which were outstandingly evident in the performance of the most advanced aircraft engines. Equally great strides were made in Champion Spark Plugs for other engines.

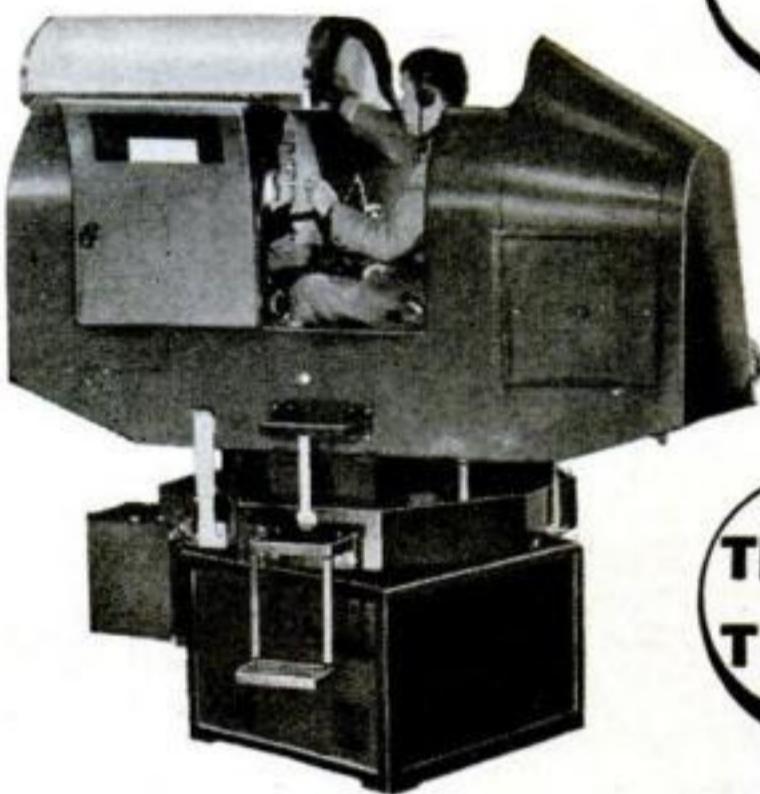
Today, there are new horizons in spark plug performance for your present car, if you insist on dependable Champion Spark Plugs. The unequalled manufacturing facilities and experience exclusive to Champion are back of every Champion Spark Plug. That's why it will pay you to insist on Champions—the automotive spark plugs with aircraft prestige and efficiency. Champion Spark Plug Company, Toledo 1, Ohio.

DEPENDABLE

CHAMPION SPARK PLUGS



**STRINGFELLOW'S 1846
MODEL...FIRST TO FLY**

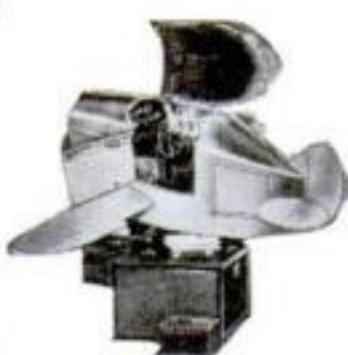


**THE LINK...FIRST MACHINE
TO SIMULATE FLIGHT**

Stringfellow proved a century ago that heavier-than-air craft could fly. Link proved that instrument flying could be learned on the ground. Simulated flight in the Link is amazingly real. You learn how it feels to be at the live controls of a plane in the air. You see how aircraft instruments respond to speed, altitude, and air-attitude—and how they guide you through darkness and "weather." You can make the Link glide, bank, and climb...you can practice recoveries from stalls which is a vital asset to a pilot's all-around airmanship.

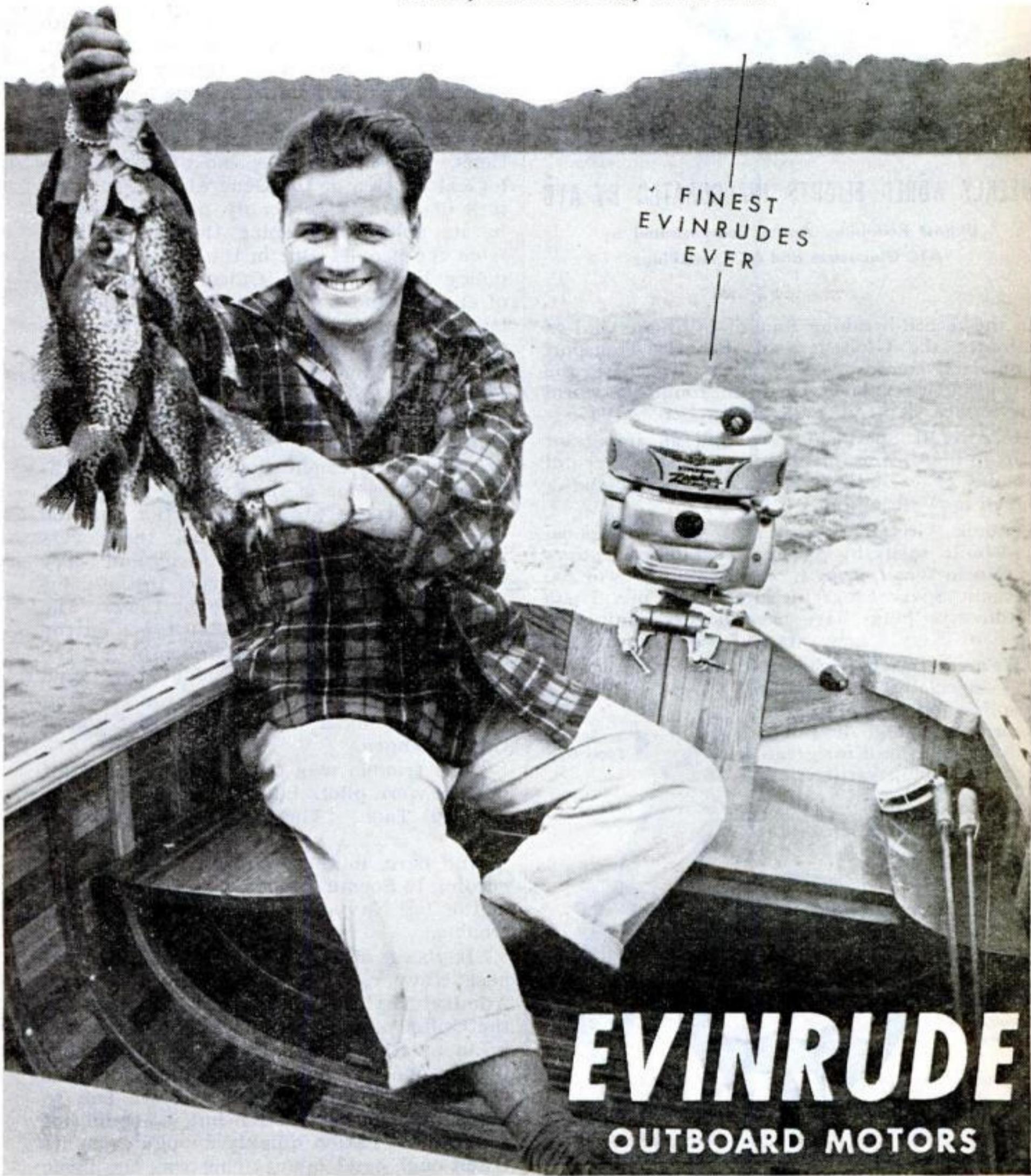
Scientifically improved over twenty years of use and experiment, the Link helped to make our flyers superior in the war skies, and has long been standard with the airlines and Air Forces. If you have the urge to fly, or if you are buying a plane of your own, training in the Link will give you greater safety, skill, and range, in the coming air age. Link Aviation Devices, Inc., Binghamton, New York. Makers of Link Trainers, Crew Navigation Trainers and other devices contributing to the safety of flight.

*Link training is your first step
into the **FLYING AGE***

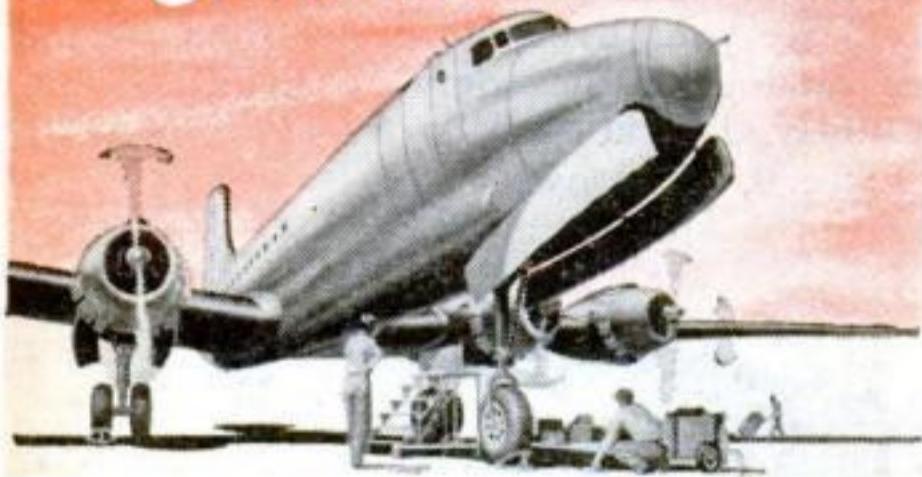


*Coming
your way -*

Steady on the course and heading right for you . . . new Evinrudes sparkling with the promise of more fun in '46! Again, a *complete line* of models — smart singles and twin cylinder motors — and three superb "fours"! All exactly as you would expect them . . . reflecting 37 years of priceless outboard *know how* . . . *the finest Evinrudes ever!* See your Evinrude dealer soon — and send for free catalog of the complete Evinrude line. Write for it today. EVINRUDE MOTORS, 5141 N. 27th Street, Milwaukee 9, Wisconsin.



AIR DREAMS COME TRUE



WEEKLY WORLD FLIGHTS INAUGURATED BY ATC

Utmost Reliability Again Demonstrated by
ATC Globesters and AC Spark Plugs

* * *

In the record-breaking time of 149 hours and 44 minutes, the Globesters of the Air Transport Command raced 23,279 miles, to chart the world's first regularly scheduled 'round-the-world air service, September 28 to October 4, 1945.

AC Aircraft Spark Plugs played an important part in that history-making flight, just as they did in the Constellation, Stratocruiser, and the 4 Japan-to-Washington B-29's.

Ceramic Aircraft Spark Plugs were originated and built, solely by AC, for the Liberty Engines of World War I. They were the outgrowth of AC Ceramic Spark Plugs for automotive use. These automotive plugs have been factory equipment on 2 of every 4 new cars and trucks since 1932.

AC's are everywhere chosen for *utmost reliability*. So,—especially since better gasoline and normal driving require a change in plugs,—follow this lead for greatest spark plug satisfaction.

AC SPARK PLUG DIVISION
GENERAL MOTORS CORPORATION



Aircraft Spark Plug



SPARK PLUGS

HELP FIGHT INFLATION—BUY VICTORY BONDS

Why Jap Air Force Died

(Continued from page 214)

and the Navy. The two branches fought like cats and dogs. All development, purchasing, and production were carried on independently until the latter stages of the war. This resulted in duplication of equipment which a small country like Japan could ill afford when she was trying to crack the big leagues.

Poor organization also carried over into the individual services themselves. Both Army and Navy were tightly compartmented organizations where one home command knew little of what went on in the next region, much less in the field of operations. One reason was the almost pathological caution of the General Staff in matters of security, probably made necessary by its policy of keeping the facts of life from the people. But in the Jap Navy, this policy boomeranged. Officers of the rank of captain and below usually didn't get the battle news! Obviously the results were inefficiency and failure.

"I didn't know what happened in what you call the Marianas Turkey Shoot," Commander Otsuki told me. "How was I to design airplanes?"

This compartmentation policy was a direct cause of one of the gravest errors that the Japs made, the introduction of too many plane types, with which they overloaded their factories. Both Army and Navy had a way of adding new types to the point of utter confusion. One count toward the last showed something like 70 types on the books at once. For this mistaken policy, the flying officers of the Jap Navy concurred in blaming the General Staff for ordering out a new model whenever combat conditions changed.

"The trouble was that the General Staff officers were pilots but not engineers," said Admiral Tada. "They didn't know production."

And here, in the field of production, according to Soemu Toyoda, the Admiral King of the Jap Navy, was the seat of the whole trouble.

"It was a situation that we in the Japanese Navy realized even before the war," Admiral Toyoda explained. "Even then, in the United States, machinery did the work; in Japan it was men. With our dense population we did not change then for fear of unemployment. In the war we had to adopt machine production but we could not convert the nation quickly enough from its traditional hand labor. This was the basic cause for the failure of our war effort."

SHARP
SHARP
SHARP

use



**5 for
25¢**

GILLETTE

BIB

*with the
SHARPEST
edges
ever honed!*

Copr. 1946 Gillette Safety Razor Co.

presents the major boxing
event of the week every Friday night over American Broadcasting Company
stations at 10 o'clock E.S.T.

Gillette Safety Razor Company, Boston 6, Mass.

YOU'RE NATURALLY

MORE

Confident



WHEN YOU LOOK YOUR BEST

You know how people talk about the fellow with the "porcupine" hair. Be careful this never happens to you! Now it's so easy to keep your hair smartly and neatly well-groomed *all day long* with Glover's Imperial Hair Dress. Try the one-minute massage tomorrow morning with Glover's Hair Dress and see the difference in more natural-looking softness that makes you feel sure of yourself. NON-ALCOHOLIC to avoid scalp dryness... ANTISEPTIC for clean, *protected* scalp! Ask for Glover's at any Drug Store or Drug Counter—or mail the Coupon today!

GLOVER'S Imperial HAIR DRESS FREE TRIAL SIZE

Send Coupon for Free Trial Size—with easy instructions for the famous Glover's 3-Way Medicinal Treatment and FREE booklet, "The Scientific Care of the Hair."

— — — — — MAIL COUPON
Glover's, 101 W. 31st St.
Dept. 661, New York 1, N. Y.

Send Free Trial Application package in plain wrapper by return mail, containing Glover's Imperial Hair Dress, GLO-VER Shampoo, and Glover's Mange Medicine in hermetically-sealed bottles, with informative FREE booklet. I enclose 10¢ to cover cost of packaging and postage.

Name _____

Address _____

City _____ Zone _____ State _____

Now! A Better Soldering Tool... THE KWIKHEAT

THERMOSTATIC SOLDERING IRON

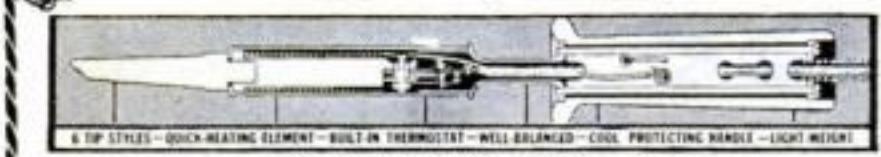


6 TIP STYLES

- #0-\$1.25
- #1-\$1.25
- #2-\$1.25
- #3-\$1.25
- #4-\$1.75
- #5-Melting Pot
for tinning—\$1.25

HOT, READY FOR USE ONLY 90 SECONDS after plugging in! Kwikheat is the only soldering iron with a thermostat built into the tool itself*—maintaining the proper level of heat for most efficient, economical operation. SAFE! ... Cannot overheat—ECONOMICAL! ... Lasts longer—saves tips and requires less retinning. POWERFUL!—225 watts—yet exceptionally light weight (14 oz.). Well-balanced with cool protecting plastic handle. Modern streamlined design. Six interchangeable tip styles adapt one Kwikheat Iron to all your soldering jobs. You will be proud to own America's finest and most versatile soldering tool...from tip to plug Kwikheat is in a class by itself. Ask your dealer to demonstrate the quick-heating feature now!

*patented
Kwikheat Iron with choice of Nos. 0, 1, 2, 3 or 4 tips \$11.00
Set of 5 tips, consisting of Nos. 0, 2, 3, 4, and 5 \$6.00



6 TIP STYLES—QUICK-HEATING ELEMENT—BUILT-IN THERMOSTAT—WELL-BALANCED—COOL PROTECTING HANDLE—LIGHT WEIGHT

Dept. PS-1r, Kwikheat Division of
SOUND EQUIPMENT CORP., 3903 San Fernando Rd., Glendale, 4 Calif.

DON'T TAKE CHANCES wear light-weight, MARTINDALE DUST MASK!



It's foolish to breathe dust and dirt when it can be avoided in thousands of instances by using a face-fitting Martindale Aluminum Mask and replaceable gauze filter pads.

In the home—home work shop—barn—hen house—feed mill—factory etc., etc., these masks offer excellent protection against over 400 dusts such as wood, coal, grains, rust, paper, insect powders, etc.

This type of filter is especially recommended for use with DDT preparations.

In use for 10 years in thousands of plants.

SPECIAL OFFER

1 Mask and 50 Refill Pads
sent postpaid on receipt of... \$1.00

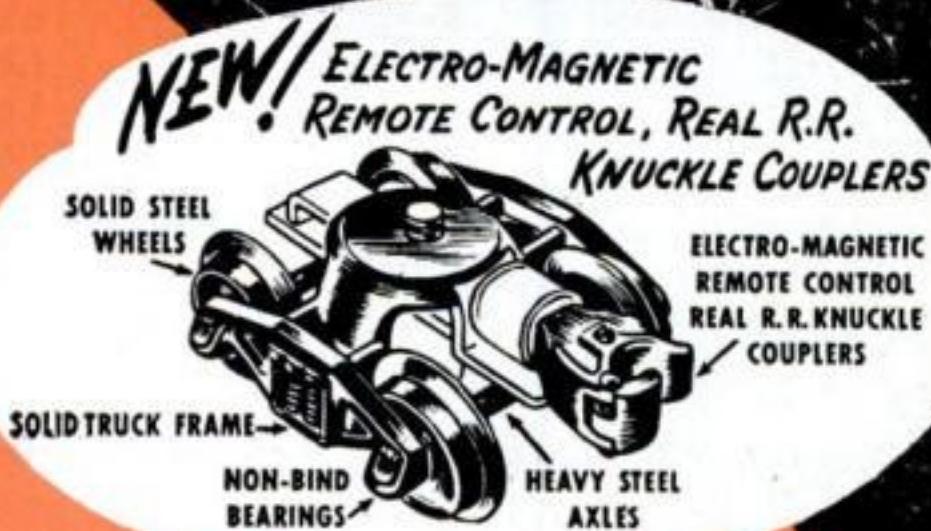


MARTINDALE ELECTRIC CO.
1373 HIRD AVE. • CLEVELAND 7, OHIO

LIONEL

TRAINS ARE BACK AGAIN

The New 1946 Lionel 4-car Freight Set is on the market in limited quantities. But MORE are on the way! Set features Brand New Electro Magnetic Real Railroad Knuckle Couplers, solid steel wheels, and die cast trucks. It is a beauty! Yet this is only a pre-view of the sensational surprises coming from LIONEL in 1946. (Insert shows new truck and coupler assembly.) Suggest you write for the two books below.



BOTH BOOKS FREE CLIP AND MAIL THIS COUPON NOW!



The Lionel Corporation
Dept. No. NB
15 East 26th Street, New York 10, N. Y.
Please rush my Two Big FREE Booklets!

Name.....

Address.....

City..... Zone No..... State.....



**Build
a profitable
business
quickly with...**

HOBART "Simplified" arc welding



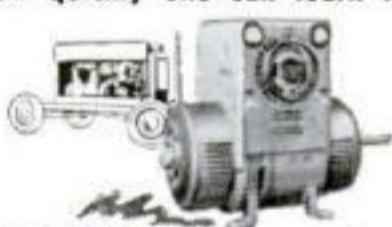
**They Bring in the Big Pay
Jobs to Hobart Owners**
You're equipped to do all kinds
of jobs when you have a Hobart
welder — you're not limited to
just a few types of work. Used
by the U. S. Army and Navy. If
you were in Service you'll un-

derstand why. With Hobart you'll be able to demand higher
prices because it's really easy to get both speed and quality
with Hobart "Simplified" Arc Welding. Some reasons are:

DUAL CONTROL. Gives choice of 1000 combinations of voltage
and amperage, offering you the exact welding heat for every
type repair or construction job. Guarantees superior welds!

REMOTE CONTROL. Another exclusive Hobart feature that lets
you control the welding heat at the work—no matter how far
away it may be from the welder. Speeds up welding!

IT'S SIMPLIFIED! It's surprising how quickly one can learn to
obtain professional welds with
Hobart "Simplified" Arc Welding.
Nothing is complicated to
do or understand—another
reason for the big success of
Hobart Welders. Clip coupon
now. Let us tell you about it.



**YES, YOU CAN "BUILD YOUR OWN" Hobart Gas
Engine Drive Arc Welder**



With a Hobart generator and
easily-obtained auto parts you
can build your own gas drive
arc welder that lets you go out
after every welding job right
in the field—and save hundreds
of dollars, or you may purchase
a complete factory-built unit.
Clip coupon for the details.

**HOBART BROTHERS CO.
BOX P-161, TROY, OHIO**
"One of the World's Largest
Builders of Arc Welders"

Free!

Valuable "Vest
Pocket Guide"
Mail coupon.

REACH FOR YOUR SCISSORS
HOBART BROS. CO., BOX P-161, TROY, O.



Send me information on
the Hobart "Simplified"
Arc Welder—without obligation. Also items I've checked.

- Vest Pocket Guide Booklet Info on Welding School
 Info on "How to Build Your Own"

NAME _____

ADDRESS _____

Toughest Snow Shoveling

(Continued from page 96)



85 miles an hour, plows sometimes have to be used as anchors to hold parked aircraft steady against the gales. One gale in Greenland blew a Fortress clear across the base, dragging tie pins and all until the tail rested in the water. Spoiler boards are also used along the wings to kill the lift over them and prevent their being lifted off their wheels and slammed down again. It takes a right smart breeze to lift a B-17 Fortress bodily and bang it back on the concrete apron.

Some arctic gales drive the snow into giant icy drifts too high and tough for even the Sno-go's to tackle. Then the pick-and-shovel gang go to work and break it up for the trucks to haul it away. One man on each unit of equipment watches the control tower for red lights warning him of landing planes. The machines then move off the runway and stop, but as soon as the plane touches down the equipment swings back into action.

At some of the bases the snow-removal gangs have developed other techniques. At Goose Bay, Labrador, for example, the snow is sometimes rolled into a hard surface with huge snow rollers.

Farther south, quick thaws and freezes require liberal sanding of icy runways. The sand itself is a problem at some bases and at a premium at most of them, so the bases make much of their own with rock crushers. Sand (ground somewhat coarser than usual to retain the heat longer) is heated almost red hot before it is thrown on the ice-coated runways, where it sinks into the ice and freezes in before it can be blown away.

Methods perfected on the North Atlantic route can be used in Alaska, Siberia, and other frigid lands. Removing up to 500,000 square yards of snow a day, however, has cost the Government up to \$25,000 a day, or roughly \$500,000 a year, at a single base. Airline promoters are waiting to see how long the landlords are prepared to pay for the world's biggest snow-sweeping jobs.

—C. B. COLBY.

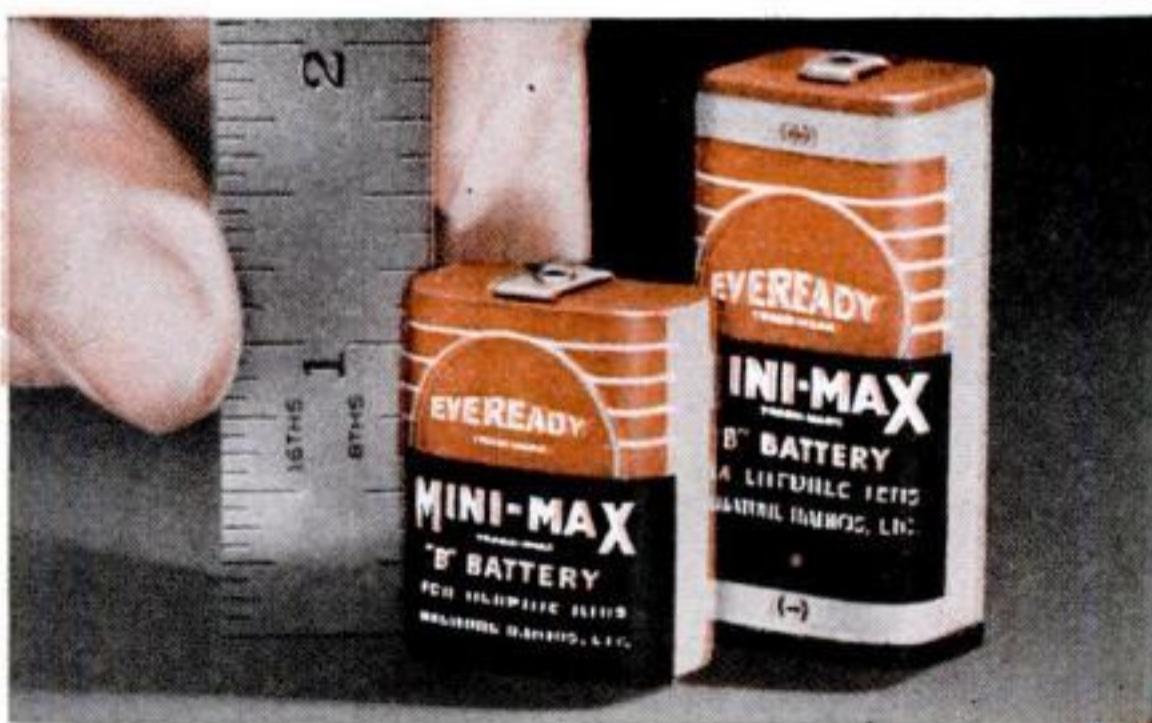


DEATH IN THE AIR. Many a Jap pilot, spinning down in flames from high over an American warship, quite literally never knew what hit him. Neither did enemy intelligence, bewildered by the accuracy of Allied gunnery.

FIVE-TUBE RADIO transmitter and receiver, in the fuse of the shell, is the brain of the secret weapon. In flight, the transmitter broadcasts a continuous radio wave. Reflected back from the target, this wave explodes the shell at exactly the right moment!

THE SHELL WITH A "RADIO BRAIN"

Army, Navy lift censorship on mystery weapon that licked V-Bomb, Kamikaze attacks



TYPICAL of "Eveready" "Mini-Max" power is this 15-volt hearing-aid battery. Small, light, economical, it makes possible lighter, easier-to-wear hearing aids. It is now available.

"CIGARETTE-CASE" RADIOS, small enough to wear, are made possible with this "Mini-Max" Battery. It packs 22½ volts into a package smaller than a standard box of safety matches!

NOT EVEN the Atomic Bomb was more "hush-hush" than the "Variable Time Radio Proximity Fuse"—a fuse mechanism that decides for itself when to explode; requires no advance setting.

Transmitter, receiver, and detonating mechanism all draw power from a tiny "Eveready" "Mini-Max" battery: a "powerhouse" rugged enough to withstand the shock of the gun's discharge: a force 20,000 times that of gravity!

EVEREADY
TRADE-MARK

MINI-MAX
TRADE-MARK

The registered trade-marks "Eveready" and "Mini-Max" distinguish products of National Carbon Company, Inc.

ROYALTON CROWN KEEPS A MAN PIPE-HAPPY. Why not! His smoking pleasure stays keen—never dulled by harsh juices and slugs. These gremlins are ruthlessly detoured from the mouthpiece by protective features found only in a Royalton Crown. With this matchless pipe, the first and last puff of the day taste equally cool... dry... satisfying.



FOR MEN WHO

REALLY KNOW PIPES

MOUTHPIECE TUBE
prevents backflow
of moisture

CONDENSING CHAMBER
traps and holds bitter
juices and sediment

BOWL GUARD
keeps shank
and bowl dry

REMOVABLE SECTION
eases thorough cleaning

CHAMBER GUARD
bars tobacco fragments
from bit

\$ | 50

Selected Briar

Patented

HENRY LEONARD & THOMAS, INC., OZONE PARK 17, N.Y.

IT'S PROFESSIONAL PERFORMANCE THAT COUNTS!

Finesse!!
**THE TRICK IN
FINE SHAVING!**

Deft, swift movement...the hand is quicker than the eye with PROFESSIONAL Blades... *a whisk, and you're whiskerless!*

The toughest of beards disappear like magic, and from this "package of tricks" comes a new shave sensation—a skin-tingling glow that *defies comparison*.

Try PROFESSIONAL Blades today—you'll be amazed at these smoother, cooler, closer shaves. And remember, too—you pay no more for the *Best Shave Ever!*



SINGLE OR
DOUBLE EDGE
**5 BLADES FOR
25c**

PROFESSIONAL
SURGICAL STEEL
MADE IN U.S.A.

PROFESSIONAL BLADE CO., NEWARK 2, NEW JERSEY



"Gee, Dad, you sure need new Sealed Power Rings!"

SMOKE from the exhaust always means oil burning, inefficient combustion, an engine that's growing old too fast. It's a sure sign of worn piston rings. Get your favorite repairman to install new Sealed Power Piston Rings now—restore original power, lengthen engine life, save oil, save gas.

Sealed Power Individually Engineered Ring Sets are selected from twenty-six basic designs of piston rings. Whatever the make, model, and cylinder-wear condition of your engine, there's a Sealed Power Set specifically engineered to do the best possible job in it. Sealed Power Piston Rings have been the choice of major engine builders for 34 years, a record of which Sealed Power workers are extremely proud. For maximum power, say "Sealed Power." Sealed Power Corporation, Muskegon, Michigan and Windsor, Ontario.

KEEP YOUR WAR BONDS! GET \$4 FOR \$3!

© 1946, Sealed Power Corp.

For better results 26 Basic Ring Designs

No one piston ring design can meet all replacement needs. Sealed Power Individually Engineered Ring Sets are made up from twenty-six (26) basic ring designs, which permit each set to be specifically engineered to do the best possible job in a particular make of engine.

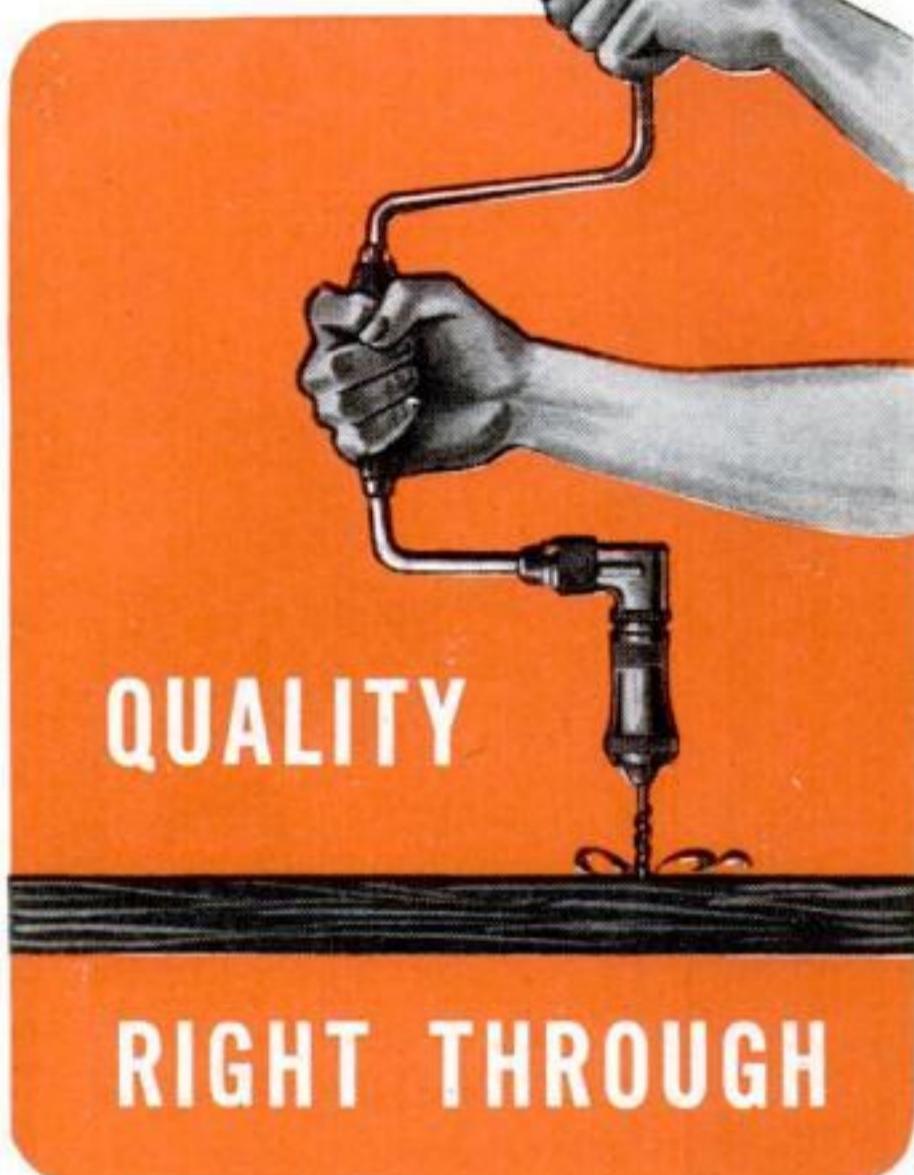
These ring sets are engineered to save gas without sacrifice of oil economy, to save oil without inducing friction and cylinder wear. Each set gives *balanced* performance in a particular engine.

Piston Rings
Pistons
Cylinder Sleeves
Valves
Water Pumps
Chassis Parts



SEALED POWER PISTON RINGS

BEST IN NEW CARS! ★ BEST IN OLD CARS!



The first time you use a Millers Falls Brace and Bit you'll know you have hold of **QUALITY** tools. You'll *feel* the precise balance of the brace and the dispatch with which the bit speeds cleanly through the wood, however hard.

This same quality runs right through the complete line. There are Millers Falls hand and electric tools for a thousand and one uses. The variety is almost unlimited. But the sterling quality is the same.

See your dealer. Millers Falls fine tools are becoming increasingly available.

One Thing in Common—**QUALITY!**

**MILLERS FALLS
TOOLS**

MILLERS
FALLS COMPANY

SINCE
1868

GREENFIELD
MASSACHUSETTS

**MORE VERSATILE
THAN EVER**

BURGESS
vibro - tool
Trade Mark Reg. U. S. Pat. Off.

Gives power to your craft skill in embossing, tooling, carving, slicing, engraving, and a host of other craft and shop jobs where "hand work" quality is desirable.

Operates by vibration, 120 strokes per sec.; 110 V AC, 60 cycles.

The Vibro-Tool, complete with engraving needle \$7.50; with all attachments \$10.90.

**SEE YOUR DEALER TODAY
Or Order Direct
HANDICRAFT DIVISION**

BURGESS BATTERY COMPANY
176 N. Wabash Ave. • Chicago 1, Ill.

**HUNTER'S
C O M P A S S**
Hunting Case,
Watch Type, All **\$3.75**
Metal, Jeweled

**Engineers All Metal Army
Type Hand-Sighting
L E V E L S**
\$1.50

PUBLIC SPORT SHOPS
13 S. 16th St., Phila. 2, Pa.
No COD's

**SHAW and "Peppy-Pal"
DU-ALL GARDEN TRACTORS**

• 1 to 9 H.P. Circulars on request. Building more now—We supply repairs for all SHAW Tractors sold in our 42 years in business.

**BUILD YOUR OWN RIDING
TRACTOR—"WAR HORSE"**

using old auto parts, powered by 2 H.P. or larger air-cooled engine; or walking type Garden Tractor $\frac{1}{2}$ to 3 H.P. or convert truck or auto into Farm Tractor. Each with steel or rubber tires: will plow, cultivate. Plans for building, in few hours, any one of above, postpaid for \$1.00 (state which wanted) or all 3 for \$2.00. Money Back Guarantee.

SHAW MFG. CO., 5701 FRONT ST.
Galesburg, Kansas
668PS North 4th St., Columbus, Ohio



MOTO-TOOL ★ THE "POCKET-SIZE" MACHINE SHOP

PUT THIS "WAR VETERAN" TO WORK

Approximately
27,000 R.P.M.

READ MOTO-TOOL'S RECORD

Long before Pearl Harbor Dremel Moto-Tools had won their spurs in tool rooms, machine shops, home workshops. Now they have the respect of every branch of the armed forces. And thousands of them helped establish production records at General Electric, Westinghouse, Remington Arms, Ford, Nash-Kelvinator, Consolidated Aircraft, Douglas and others.

Now that priorities have been lifted, Moto-Tool can work for you. Moto-Tool owners daily discover new jobs that can be done more expertly in less time. In fact, new purchasers find dozens of uses in addition to those they had in mind. So great is the saving of time and labor with Moto-Tools, thousands of mechanics and craftsmen would find it difficult to get along without their "mighty little midgets."

ONLY MOTO-TOOLS HAVE ALL THESE FEATURES

A Model 2 Moto-Tool develops a speed of approximately 27,000 rpm. Weighs only 13 oz. Shaped to fit the hand. Sturdily built with shock-proof bakelite housing. Balanced for vibrationless operation. Uses 110-120 AC or DC current.

10 DAY TRIAL—Money Back Guarantee

Ask your dealer today about Dremel Moto-Tools and Accessories. If he does not handle them, order direct from factory on 10 day trial. We ship postpaid if cash in full accompanies order. If you prefer to send only \$2.00, Moto-Tool will be shipped C.O.D. for balance plus postage. Catalog sent FREE.



MOTO-TOOL KIT
Kit No. 2 with 23 high grade accessories and Model 2 Moto-Tool, in hardwood case \$23.50
Model 2 Moto-Tool with one accessory \$16.50

DREMEL MFG. CO. Dept. 126-A RACINE, WIS. U.S.A.



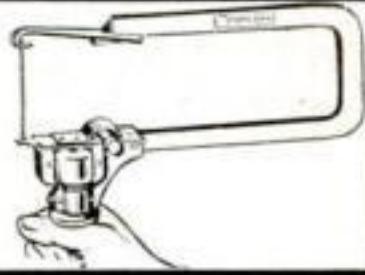
MODEL 2
Illustrated

A FEW OF THE JOBS THAT MOTO-TOOL CAN DO FOR YOU

- | | | |
|--------------------------------------|-------------------------------------|-----------------------------------|
| <input type="checkbox"/> Sharpening | <input type="checkbox"/> Burrng | <input type="checkbox"/> Cleaning |
| <input type="checkbox"/> Finishing | <input type="checkbox"/> Grinding | <input type="checkbox"/> Routing |
| <input type="checkbox"/> Touching Up | <input type="checkbox"/> Polishing | <input type="checkbox"/> Cutting |
| <input type="checkbox"/> Sanding | <input type="checkbox"/> Burnishing | <input type="checkbox"/> Rasping |
| <input type="checkbox"/> Drilling | <input type="checkbox"/> Inlaying | <input type="checkbox"/> Carving |
| <input type="checkbox"/> Mortising | <input type="checkbox"/> Sawing | <input type="checkbox"/> Flushing |
| <input type="checkbox"/> Engraving | <input type="checkbox"/> Scoring | <input type="checkbox"/> Dressing |

WATCH FOR THE RETURN OF MOTO-SAW

Dremel Moto-Saw . . . the sensational electric scroll saw . . . will be back as soon as materials are available.



WELL, DON'T JUST STAND THERE, GET THE WELDWOOD GLUE!

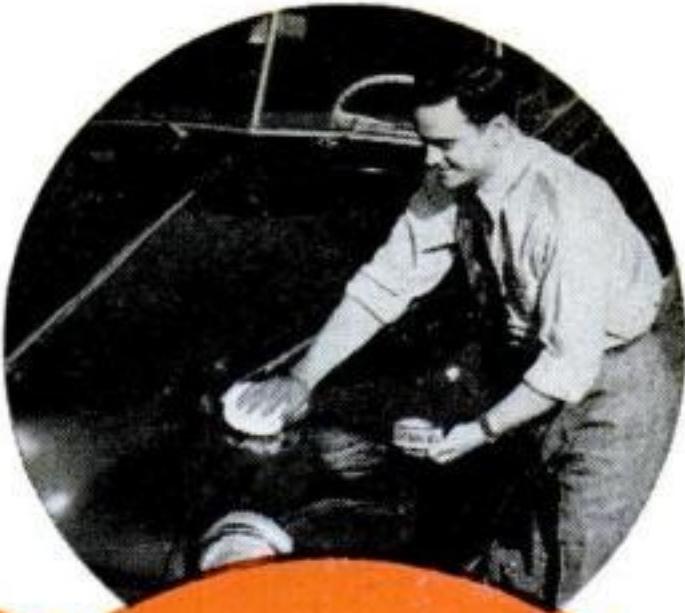


When you want to fix things fast . . . remember Weldwood Glue. It's quick to mix . . . easy to use . . . tremendously strong . . . stain-free . . . rot-proof . . . and permanent. At hardware stores, lumber yards, chain stores.



UNITED STATES PLYWOOD CORPORATION, New York 18, N.Y.

WELDWOOD
PLASTIC RESIN
WATERPROOF GLUE



SIMONIZ

Simoniz Protects the Finish for Winter Driving!

*Saves your Car's Beauty
and Trade-in Value.*

Until you have that new car... be proud of your old one. SIMONIZ it for protection against winter weather... against slush, mud and freezing cold. Saves car trade-in value, too. Simoniz Kleener, liquid or paste, restores dull finishes to shiny newness... SIMONIZ keeps it sparkling, eliminates frequent washings. Easy to use... gives beauty and protection months longer. Don't let winter ruin your car's finish... SIMONIZ today!

THE SIMONIZ COMPANY, CHICAGO 16, ILL.

Sold by grocery, hardware, drug, paint, 5¢ to \$1, auto accessory, department stores, garages and service stations.



MOTORISTS WISE

SIMONIZ

HOUSEWIVES DO LIKEWISE

Fooling Enemy Radar

(Continued from page 83)

electric echo. The measurement of the round-trip time of the echo gives the distance of the detected object. A man, shouting loudly toward a cliff, hears his call echoed plainly. But if another man shouts continuously at the same time from some point among the cliffs, the first person cannot hear his own echo. This is analogous to what happens in electronic jamming.

Radar betray their existence and location by their pulsing beams. They can be heard by a "search receiver" at a greater distance than the radars can detect the plane or ship carrying this instrument. We designed airborne direction finders, with which to pin-point enemy radars, and "pulse analyzers," which told us the pulse width, echo periods, and frequencies of German and Jap equipment. Musical tones revealed whether the sets were high- or low-frequency types, and our own radar countermeasures experts could deduce accurately the purpose of these sets.

The AAF and Navy planes that carried this special equipment were known as "ferrets" because they ferreted out troublesome enemy radars. Ferrets were also equipped with window and rope, and other jammers called "carpet" and "rug." They operated offensively as well as defensively by jamming radars to screen the approach of our bomber and warship formations. Wider application of window and jamming sets by regular bombers cut down our losses to enemy antiaircraft and night fighters to a surprising degree.

The enemy, however, adopted certain countermeasures to thwart the far superior Allied radar. Then Army, Navy, and civilian RCM people found means to counter the countermeasures. We reproduced German and Jap radars, had our own planes apply countermeasures, and worked out defenses against American jammers and window to see how the enemy would try to do the same thing.

This electronic warfare will benefit America's peacetime activities in this field. Our radio development has been, for the most part, directed toward the use of higher-frequency equipment. First came broadcast long-wave radio, then short-wave radio, and then FM. This trend was accelerated by the laboratory work on radar, television telemetering, and certain continuous-wave techniques. These efforts represent the very developments which will improve greatly our postwar communications and television, as well as other branches of electronics.

"It's the light one that's going with me!"



That's the way all America's going . . . toward *ultra-lightness with magnesium!* . . . ★ You're very likely to find magnesium in a fine new portable typewriter . . . designed, styled, constructed in the best tradition of today. Take hold of the handle: Incredibly light! Lifts like a dream, to desk or shelf . . . swings lightly in your hand when you're off down the street. Strong and durable, too, this extraordinary metal—worth whatever slight price premium it may entail. ★ Dow, of course, is not in the typewriter business.

But the hundreds of diversified manufacturers with whom this foremost magnesium producer cooperates are planning now to bring you new and better lightweight products of many kinds.

Ready... to make products move!

MAGNESIUM

LIGHTEST OF ALL STRUCTURAL METALS



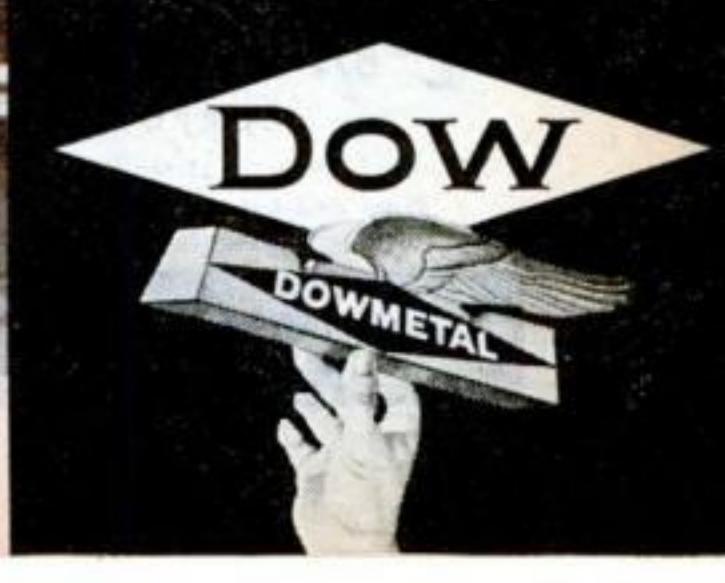
metal from the sea, and from
brine wells, too, is ex-
and in abundant quantities
now, the nation's foremost
producer.



Best magnesium fabrication tech-
niques are developed by Dow
in cooperation with many skilled
and experienced fabricators
throughout the country.



Mighty industrial applications
and fine consumer products are
included in the growing list of
magnesium items made through
Dow cooperation.



MAGNESIUM DIVISION • THE DOW CHEMICAL COMPANY, MIDLAND, MICHIGAN

Newark : Boston : Philadelphia : Washington : Cleveland : Detroit : Chicago : St. Louis : Houston : San Francisco : Los Angeles : Seattle

Copyrighted material

it takes a **CLEAN ENGINE**
to deliver **FULL POWER!**

TO CLEAN OUT
THE ENGINE



TO KEEP IT
CLEAN

Sludge, gum and acid accumulations create abnormal conditions and "foul up" engine parts. LOOSITE, a basic cleaner, rids the engine of all sludge and gum. It reaches valves, rings and pistons; restores their real efficiency. It is safe, easy and economical to use.

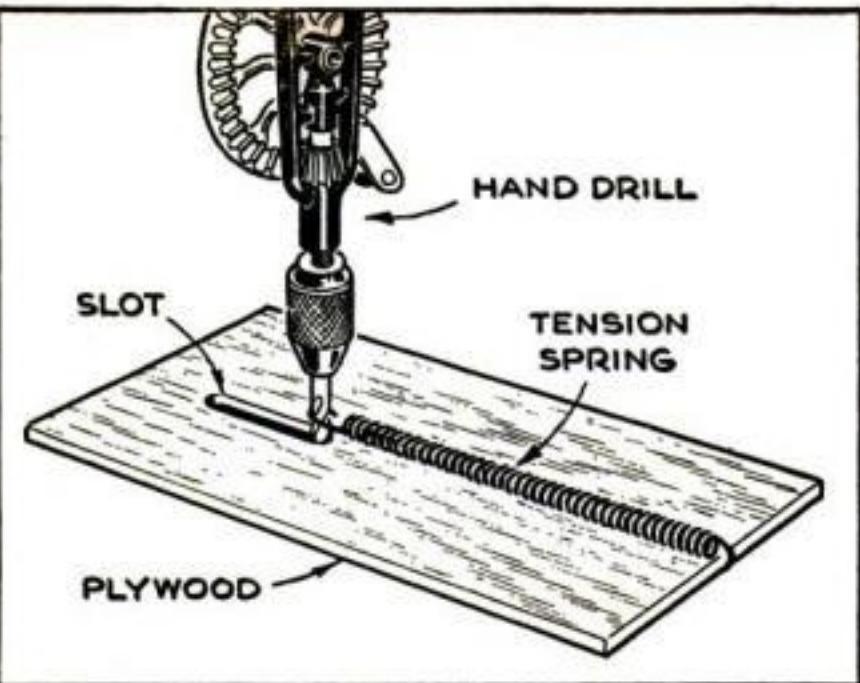
After one LOOSITE treatment, a can of SILOO added with each change of crankcase oil, keeps your engine clean by dissolving immediately any new sludge formations. SILOO, the seven-solvent compound with four inhibitors, becomes an integral part of the lubricant itself—cannot be removed by any standard filter. This is important.

A LOOSITE-SILOO treatment will show immediate results on any make and model car—regardless of quality or brand of oil used. Fifteen years of service endorses its use.

SOLVENTS FOR ALL TYPES OF PETROLEUM RESIDUES
Petroleum Solvents
CORPORATION

General Offices: 331 Madison Ave., N. Y. 17, N. Y.
Plant and Laboratories: Port Reading, N. J.

If you heat with oil — write for information on
SILOO FUEL OIL TANK SOLVENT

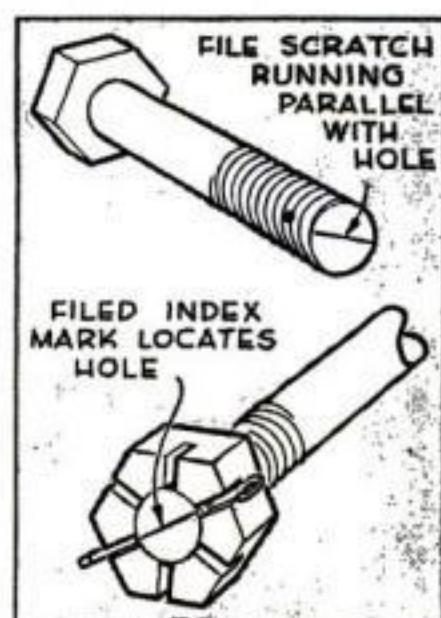


Hand Drill Cuts Slot in Plywood

WHEN a slot is needed in plywood, the job can be done with a hand drill and a tension spring. Drill a hole at the point where you want one end of the slot, hook the spring over the drill and the end of the board, and operate the drill.—RONALD EYRICH.

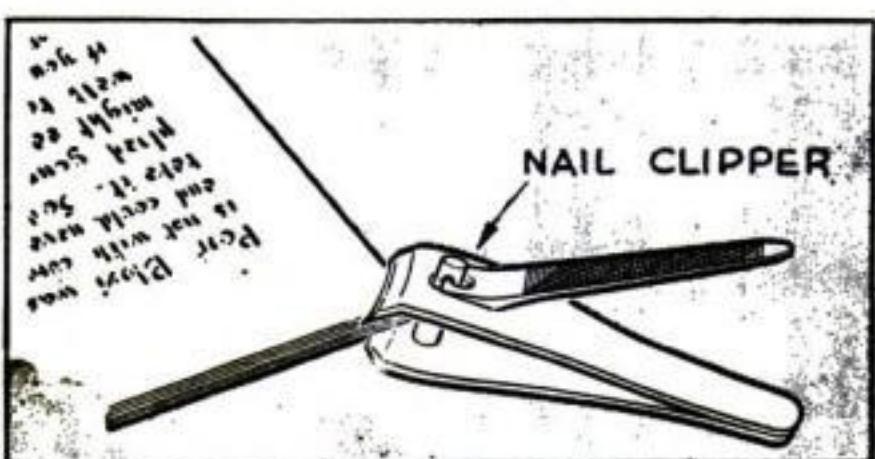
Scratches Mark Cotter-Pin Holes

FILE marks across the ends of bolts parallel with cotter-pin holes afford a positive way of locating the holes, especially when they are hidden by grease or dust. When a castellated nut is used, the hole is quickly brought into line by turning the nut until the mark is between castles.—J. K.



Nail Clipper Rounds Book Corners

SQUARE corners of booklets that have become worn and curled can be neatly rounded with an ordinary nail clipper. It will cut several pages simultaneously.—FRANK SHORE.





RCA's new television camera has a super-sensitive "eye" that sees even in the dimmest light—indoors or outdoors.

A television camera "with the eyes of a cat"

As a result of RCA research, television broadcasts will no longer be confined to brilliantly illuminated special studios.

For RCA Laboratories has perfected a new television camera tube, known as Image Orthicon. This tube can pick up scenes lit by candlelight, or by the light of a single match!

Operas, plays, ballets will be televised from their original performances in the darkened theater. Outdoor events will remain

sharp and clear until the very end!

From such research come the latest advances in radio, television, recording. RCA Laboratories is your assurance that when you buy any RCA product you become the owner of one of the finest instruments of its kind that science has achieved.

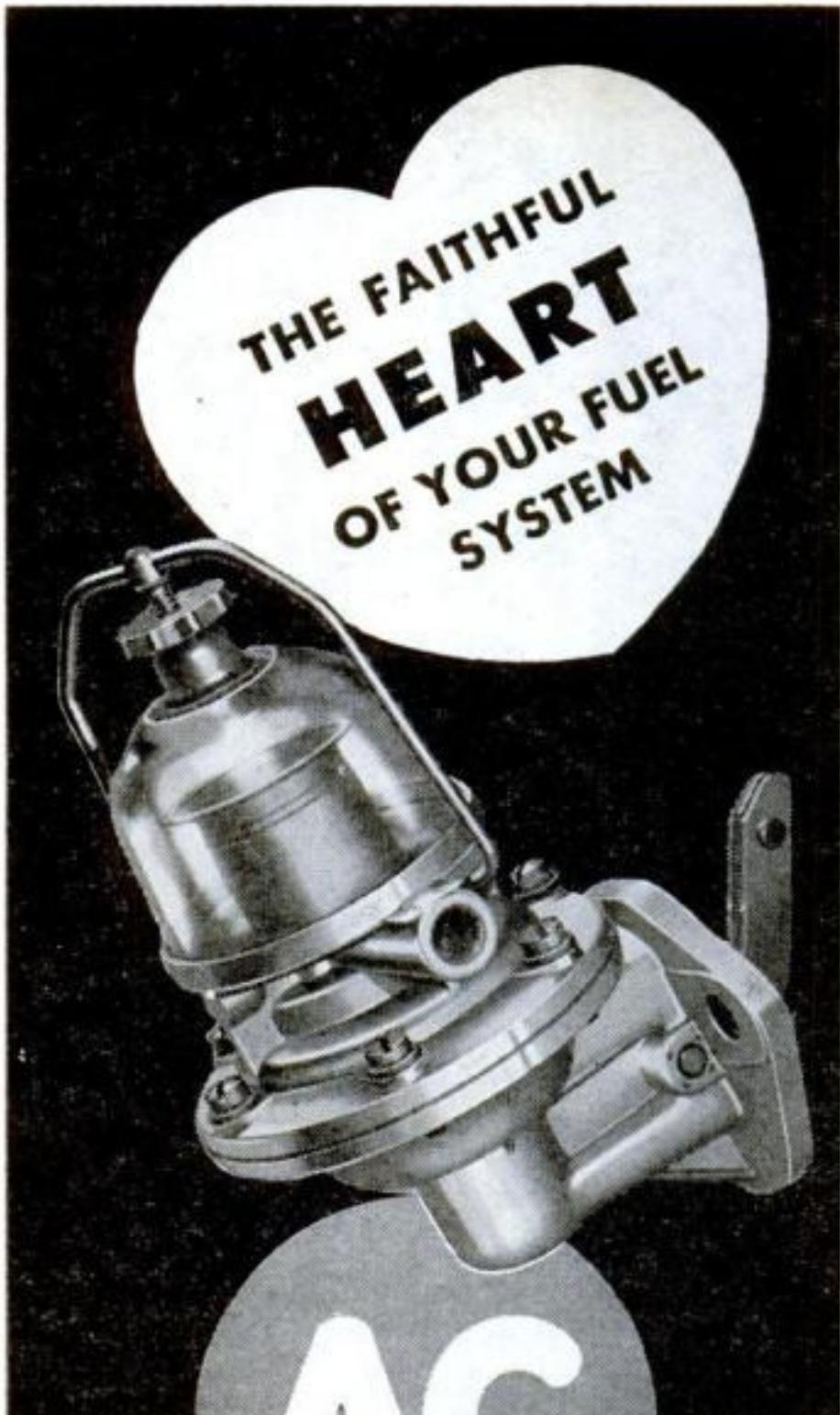
Radio Corporation of America,
RCA Building, Radio City, New
York 20. Listen to *The RCA Show*,
Sundays, 4:30 P.M., Eastern Time,
over the NBC Network.



RCA Victor television receivers with clear, bright screens will reproduce every detail picked up by the RCA television camera. Lots of treats are in store for you. Even today, hundreds of people around New York enjoy regular boxing bouts and other events over NBC's television station WNBT.



RADIO CORPORATION of AMERICA



AC FUEL PUMPS

Pulsing steadily, hundreds of times a mile, your AC Fuel Pump is the strong, reliable heart of your fuel system. It has given you long, faithful service because of its inbuilt quality and scientific design.

You can prolong that faithful service indefinitely, if you insist upon an AC when you replace your present pump with a new or rebuilt one.

AC SPARK PLUG DIVISION • GENERAL MOTORS CORPORATION

TAKE CARE OF YOUR CAR TILL
NEW ONES ARE AVAILABLE

speco

PLASTIC PLIERS

- Weighs 1½ ounces!
- Absolutely shock-proof non-magnetic!
- 6,000 volt breakdown!
- Heat resistance 240 to 300 degrees!
- Tensile strength of material, 5000 lbs. per square inch!
- Pick up nuts, screws and washers without danger of shorting!
- Relocate wiring without disturbing magnetic fields while equipment is operating!

DEPT. A-1

ROBERTS ASSOCIATES, P.O. BOX 622, G.C. ANNEX, N.Y. 17

\$1⁰⁰

USE YOUR BENCH SAW

FOR JOINTING & CUTTING MOULDINGS



With our six inch tool steel cutters make mouldings, casings, drop-leaf tables, grooves, beading and jointing. Moulding cutters, A 1 in. wide \$1.50, 1½ in. \$1.75. Jointing cutters, B 1 in. \$1.50, 1½ in. \$1.75. E 1 in. for drop-leaf tables, \$1.50, E 1½ in. Makes ¾ in., cove & Quarter, \$1.75 Postpaid. Guaranteed. State size hole. List & Folder free.

JOHN A. SANDSTROM
Rt. 1-P.
Clearwater, Fla.



HANDY ELECTRIC TEST-LITE

Instantly Tells if Circuit is Broken!

Electric trouble shooter with hundreds of uses. Locates blown fuses, tests appliances, motors, spark plugs, electric fences, grounded lines, cables, etc. Neon indicator glows on voltages from 60 volts AC to 550 volts AC or DC. A necessity for experimenting. Complete instructions—easy to use. Satisfaction guaranteed. Available from dealers or 50c postpaid by return mail. Address Dept. A.

Ne-O-Lite Mfg. Co., Rockford, Ill., U.S.A.

PEPSI-COLA HITS THE SPOT

DETECTIVES

TRAINING—SECRET INVESTIGATIONS—FINGERPRINTS

Easy Method—Short Time.—Rewards.

Home—Travel—Secret Code-Booklet FREE—WRITE
INTERNATIONAL DETECTIVE SYSTEM
1701-P Monroe St., N. E., Washington, D. C. 18

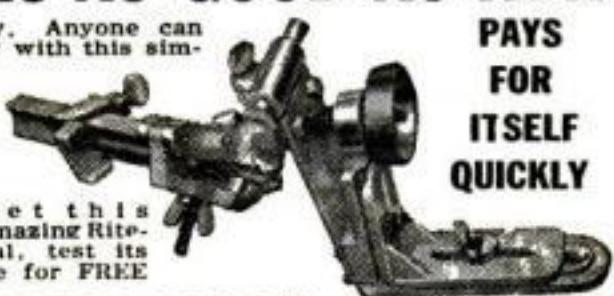
Makes OLD DRILLS AS GOOD AS NEW

Saves Time and Money. Anyone can do expert drill grinding with this simple-to-use drill grinding attachment. Fits on any bench grinder. Does not heat or burn drills so they lose their temper and crystallize.

SENT ON TRIAL Get this amazing Rite-Way Sharpener on trial, test its superior merits. Write for FREE literature today.

T & H Mfg. Co., 811-E, East 31st, Kansas City 3, Mo.

PAYS
FOR
ITSELF
QUICKLY



OTTAWA TRACTOR SAW

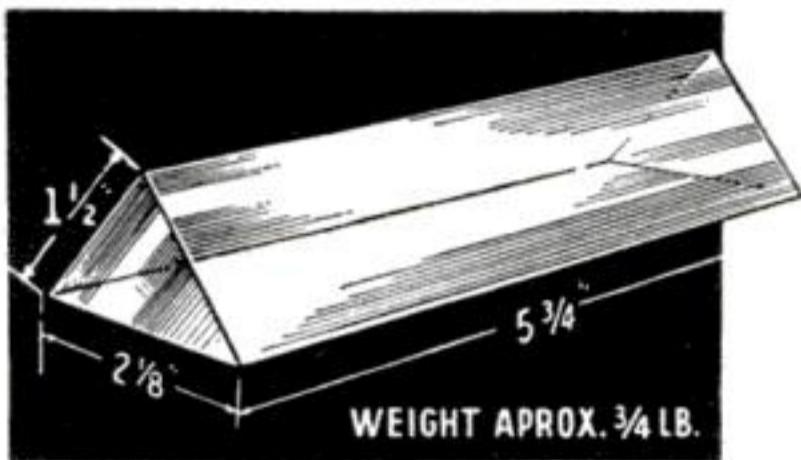


350 CUTS PER MINUTE

Make money sawing wood. Use Ottawa—fastest cutting. Cuts large, small logs easiest way. Fells trees. One man operates. Thousands in use. Built to last with heavy, stiff saw blade. Positive safety clutch control; uses power take-off any tractor.

OTTAWA MFG. CO., D101 Forest Ave., Ottawa, Kan.

BARGAINS in WAR SURPLUS LENSES & PRISMS



All Items Finely Ground and Polished but Edges Slightly Chipped or Other Slight Imperfections which We Guarantee Will Not Interfere with Their Use. Come Neatly Packed and Marked.

YOU CAN EASILY MAKE

Telescopes, Magnifiers Photographic Gadgets and Hundreds of Experiments with these Low Cost Lenses.

To translate millimeter measurements; 25.4 mm. equals one inch.

SPECIALS IN LENS SETS

Big 10 Page Project and Idea Booklet with all sets.

Set # 1-N "Our Advertising Special" 15 Lenses for \$1.60 Postpaid. For making your own powerful telescopes, low power microscope, strong magnifiers, drawing projector, photo cells, telephoto lens, dummy focusing camera, Kodachrome viewer, stereoscopic viewer, ground glass and enlarging focusing aids. For experimental optics, portraits of babies and small pets, copying, ultra close-up shots, and many, many other uses.

NEW 50-PAGE IDEA BOOK, "FUN WITH CHIPPED EDGE LENSES" Contains wide variety of projects and fully covers the fascinating uses of all Lenses in sets listed above—only \$1.00 postpaid.

14-POWER COLOR CORRECTED MAGNIFIER SET—Consists of two Achromatic Lenses and section of metal tubing for mount.

Stock # 1044-N \$1.55 Postpaid

MONOCULAR SET OF LENSES AND PRISMS from Navy's 7 x 50 Binocular. All the optics you need to make a 7 Power Monocular. Buy 2 sets to make a Binocular.

Stock # 5100-N \$5.00 Postpaid

38 PAGE DIRECTION BOOK "HOMEBUILT BINOCULARS" 50c Postpaid

TELESCOPE EYE PIECE SET—Consists of perfect Eye Lens Set from a Govt. Telescope. Diam. 1 inch. Focal Length 1 inch.

Stock # 6144-N \$1.00 Postpaid

SPECTROSCOPE SET These sets contain all Lenses and Prisms you need to make a Spectroscope plus FREE 15-page Instruction Booklet.

Stock # 1500-N Hand Type Spectroscope \$3.45 Postpaid

Stock # 1501-N Laboratory Type Spectroscope \$6.50 Postpaid

MICROSCOPE SETS

Consisting of 4 Achromatic Lenses for making a 40 Power Pocket Microscope or 140 Power regular size Microscope. These color corrected Lenses will give you excellent definition and may be used for Micro-photography.

Stock # 1037-N \$3.00 Postpaid

Consisting of Prism, Mirror and Condensing Lens. These used together with Stock # 1037-N will make an excellent Micro-projector enabling you to get screen magnification of 400 to 1000 Power according to screen distance.

Stock # 1038-N \$2.00 Postpaid

MISCELLANEOUS ITEMS

Stock No.	Item	Price
3016-N	Pentagon Prism	\$.75 each
2024-N	10 Pieces Circular A-1 Plate Glass (Diam. 31 mm.—for making Filter) . . . . .	.25
4009-N	Heat Absorbing Glass 4" x 5" . . . . .	.35 each
523-N	Six Threaded Metal Reticle Cells . . . . .	.25
26-N	First Surface Aluminized Mirror, Diam. 1 1/4" . . . . .	.25 each
624-N	Neutral Ray Filter, size 4 3/4" x 2 1/2" . . . . .	.25
22-N	Inclinometer—Aircraft type . . . . .	.25 each
704-N	Lens Cleaning Tissue, one ream (480 sheets) size 7 1/2" x 11"	1.50
1030-N	2" Diam. Reducing Lens . . . . .	.25 each
1031-N	Perfect 6 Power Magnifier—Diam. 28 mm. . . . .	.25 each
2043-N	Crossline Reticle—Diam. 29 mm. . . . .	.50 each
1034-N	Burning Glass Lens . . . . .	.25 each

(Minimum order on above—\$1.00)

TANK PERISCOPE

Complete Set Mounted Components

Have fun! Make a real Periscope. Use it to see over the heads of crowds, to see under water, to see out windows without yourself being seen, and many other uses where observation by "remote control" is required. Originally constructed for U. S. Army Tanks, set consists of 2 fine Periscope mirrors mounted in metal and plastic. Perfect condition. Only plywood body frame is required to finish this exceptional Periscope. Set weighs 2 3/4 lbs. Overall length 6 1/4", width 2 1/8". Would normally retail at \$40 to \$50. Stock # 700-N. \$3.00 Complete Set Postpaid (Two Sets (four units) Special \$5.50 Postpaid.)

TANK PRISMS

In order that the tank driver shall not get shot in the face, 2 of these Silvered Prisms are used to make a Periscope. We have secured a number of these, 90-45-45 degree Prisms of huge size—5 3/4" long, 2 1/8" wide, finely ground and polished. Used to build a Periscope, camera stereo attachment, range finder, etc. Excellent also for experiments, classroom demonstrations. Prism easily converted into desk name plate by affixing gold letters. 100 gold letters supplied at only 10c. (Order STOCK = 3008-N). Normally these Prisms would retail from \$24 to \$30 each.

SILVERED TANK PRISM

Stock # 3004-N \$2.00 each Postpaid

PLAIN TANK PRISM

Stock # 3005-N \$2.00 each Postpaid

FOUR TANK PRISMS—Special—\$7.00 Postpaid

The most sensational bargain we have ever been able to offer.

REMARKABLE VALUE!
\$141.01 WORTH OF PERFECT LENSES
FOR ONLY \$10.00

Complete System from Artillery Scope (5X) 9 Lenses, low reflection coated, absolutely Perfect. Diameters range from 1 1/3 inches to 2 1/5 inches. Used for making Telescopes and hundreds of other uses.

Stock # 5019-N \$10.00 Postpaid

16 MM PROJECTOR CONDENSING LENSES—Consists of two Condensing Lenses with combined F.L. of one inch.

Stock # 4026-N \$1.00 Postpaid

CLEANING BRUSH SET—12" flexible hollow plastic handle, circular construction. 4 brushes to set, range stiff to soft.

Stock # 504-N Price \$1.00

MAGNIFIER SET 5 Magnifying Lenses Powers from 1 to 10. Various diam. for many uses.

Free Booklet on Home-made magnifiers included.

Stock # 1026-N \$2.00 Postpaid

OPTICS FROM 4-POWER PANORAMIC TELESCOPE—Excellent condition. Consists of Objective Prism, Dove Prism, Achromatic Objective Lens, Amici Roof Prism, Eye Lens Set (. a \$60.00 value)

Stock # 5016-N \$6.00 Postpaid

35 MM KODACHROME PROJECTING LENS SET—Consists of Achromatic Lens for projecting, plus a Condensing Lens and piece of Heat Absorbing Glass with directions.

Stock # 4025-N \$1.95 Postpaid

ALL THE LENSES YOU NEED TO MAKE YOUR OWN TELESCOPE! ALL ARE ACHROMATIC LENSES

GALILEAN TYPE—Simplest to Make but has Narrow Field of View.

Stock # 5018-N 4 Power Telescope \$1.25 Postpaid

Stock # 5004-N Small 2 Power Pocket Scope \$1.00 Postpaid

TERRESTRIAL TYPE—Have Much Wider Field of View than Galilean Type.

Stock # 5007-N 11 Power Telescope \$3.20 Postpaid

Stock # 5008-N 20 Power Telescope \$3.45 Postpaid

PRISM TELESCOPES—Uses Prism instead of Lenses to Erect Image and are much shorter than Terrestrial Type. Have wide field of view.

Stock # 5010-N 6 Power Telescope \$3.00 Postpaid

Stock # 5011-N 11 Power Telescope \$3.25 Postpaid

Stock # 5012-N 20 Power Telescope \$7.25 Postpaid

Order by Set or Stock No. • Satisfaction Guaranteed • Immediate Delivery

EDMUND SALVAGE COMPANY-P.O. AUDUBON, NEW JERSEY

NEXT TIME SAY **BRIGHT STAR**

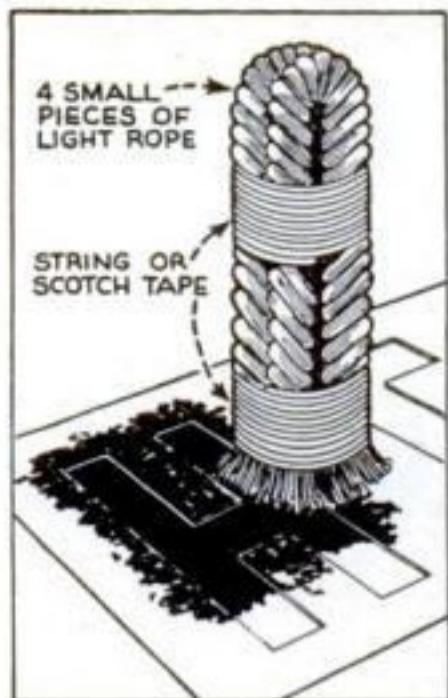
and you will get a
FLASHLIGHT & BATTERIES
famous since 1909
for **QUALITY,**
STYLE and
SERVICE



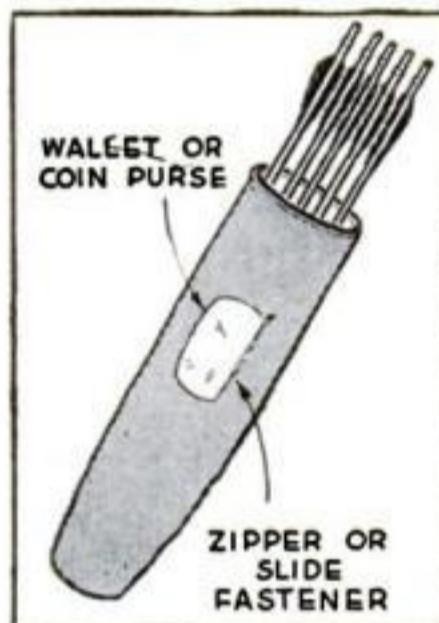
BRIGHT STAR BATTERY CO., CLIFTON, N.J.

Stencil Brush Made of Light Rope

TWO pieces of light rope will serve as a satisfactory stencil brush if a regular one is not available. Cut the two pieces to equal length, loop them side by side so that the cut ends coincide, and bind together with string or scotch tape as indicated. Then form bristles by fraying the rope ends.—N. P. G.



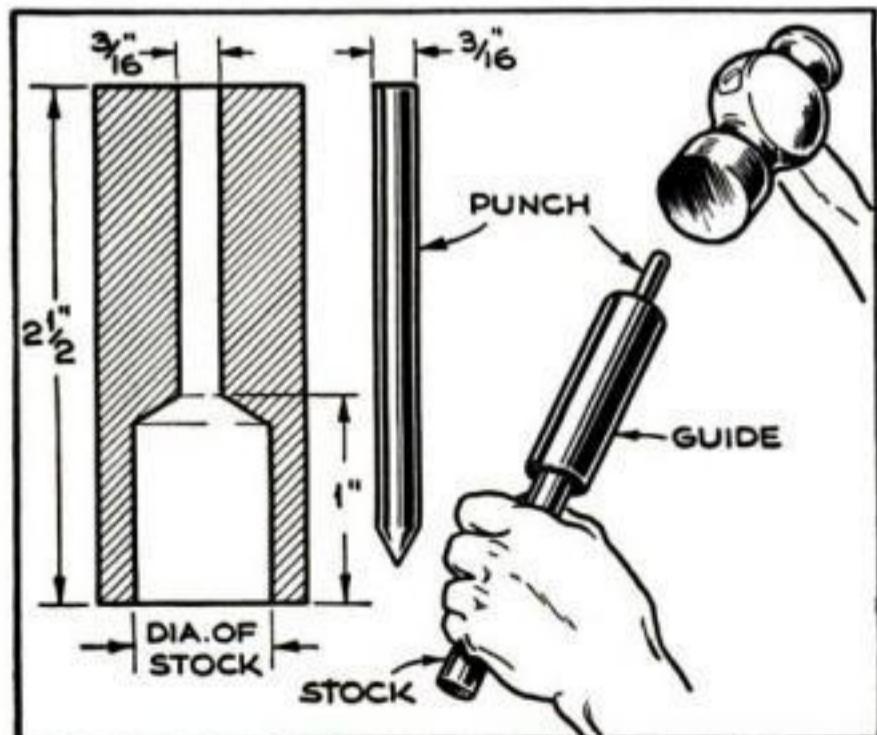
Purse on Quiver Holds Arrowheads



WHEN a person is hunting or target shooting with a bow and arrows, a zipper coin purse or wallet sewed against the side of the quiver makes a handy pouch for carrying extra arrowheads. A wallet with a slide fastener also could be used.—E. P. B.

Guide Finds Center of Round Stock

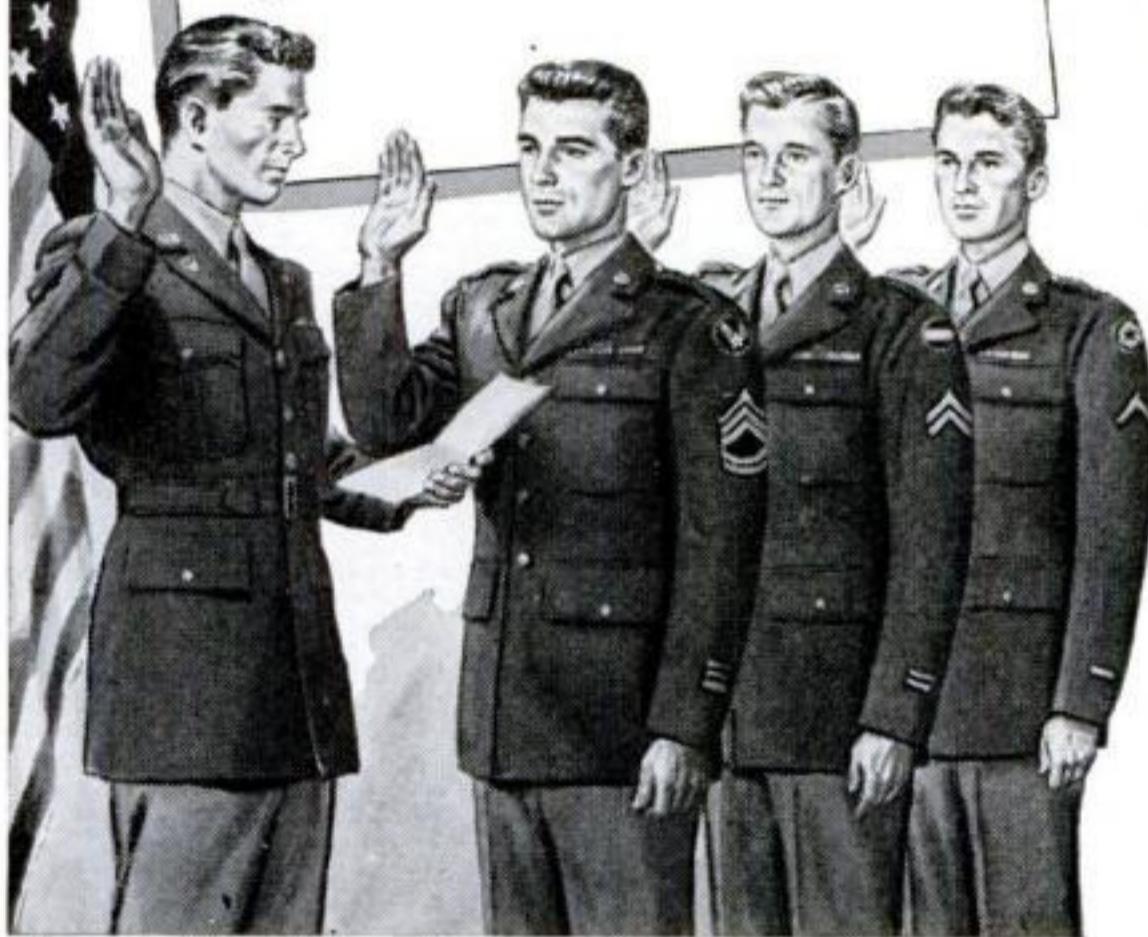
SEVERAL guides made out of steel as indicated in the accompanying diagram enable me to locate the center of wood or metal round stock with ease. The interior diameters vary to fit different sizes of stock. If preferred, one large guide could be made and bushings used.—R. E. BELLINGER.



January 31

THE LAST DAY

**for men now in the Army
to retain their present
grades by reenlisting . . .**



HIGHLIGHTS OF THE NEW ENLISTMENT PROGRAM

1. Enlistments for 1½, 2 or 3 years. (1-year enlistments permitted for men now in the Army with 6 months' service.)

2. Enlistment age from 17 to 34 years inclusive, except for men now in Army, who may reenlist at any age.

3. Men reenlisting retain their present grades, if they reenlist within 20 days after discharge and before February 1, 1946.

4. The best pay scale, medical care, food, quarters and clothing in Army history.

5. An increase in the reenlistment bonus to \$50 for each year of active service since such bonus was last paid, or since last entry into service.

6. Up to 90 days' paid furlough, depending on length of service, with furlough travel

paid to home and return, for men now in Army who enlist.

7. A 30-day furlough every year at full pay.

8. Muster-out pay (based upon length of service) to all men who are discharged to reenlist.

9. Option to retire at half pay for life after 20 years' service—or ¾ pay after 30 years' service. All previous active federal military service counts toward retirement.

10. Benefits under the GI Bill of Rights.

11. Family allowances for the term of enlistment for dependents of men who enlist before July 1, 1946.

12. Opportunity to learn one of 200 skills and trades.

13. Choice of branch of service and overseas theater in the Air, Ground or Service Forces on 3-year enlistments.

Reenlist now at your nearest U. S. Army Recruiting Station

Men now in the Army who reenlist before February 1 will be reenlisted in their present grade. Men honorably discharged can reenlist within 20 days after discharge in the grade they held at the time of discharge, provided they reenlist before February 1, 1946.

There's a long list of attractive reenlistment privileges in the new Armed Forces Voluntary Recruitment Act of 1945. The ability to keep your present grade is only one of them, but this privilege expires on January 31.

There are plenty of other reasons why many thousands of men have enlisted, and more thousands are enlisting every day. You'll certainly want to know all of the opportunities open to you. If you'll read them carefully, you'll know why a job in the new peacetime Regular Army is being regarded today as "The Best Job in the World."

PAY PER MONTH—ENLISTED MEN

In Addition to Food, Lodging, Clothes and Medical Care

	Starting Base Pay Per Month	MONTHLY RETIREMENT INCOME AFTER: 20 Years' Service	30 Years' Service
Master Sergeant or First Sergeant	\$138.00	\$89.70	\$155.25
Technical Sergeant	114.00	74.10	128.25
Staff Sergeant	96.00	62.40	108.00
Sergeant	78.00	50.70	87.75
Corporal	66.00	42.90	74.25
Private First Class	54.00	35.10	60.75
Private	50.00	32.50	56.25

(a)—Plus 20% Increase for Service Overseas.

(b)—Plus 50% if Member of Flying Crews, Parachutist, etc.

(c)—Plus 5% Increase in Pay for Each 3 Years of Service.

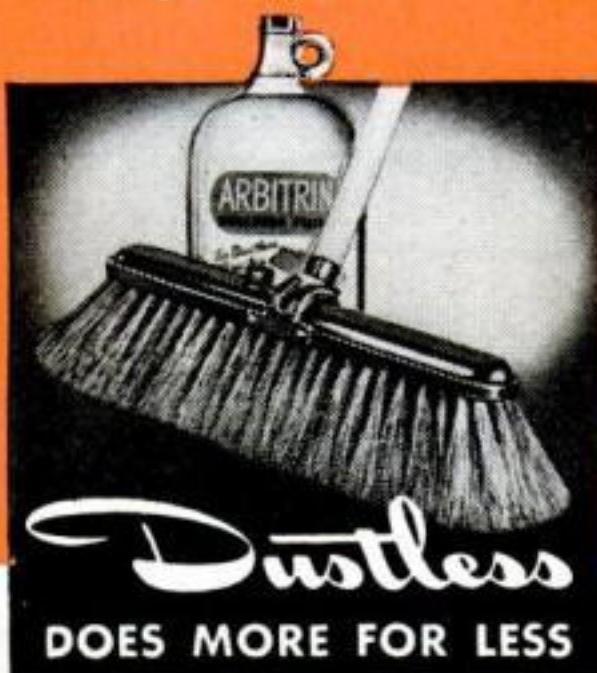
**SEE THE JOB THROUGH
U. S. Army
BE A
"GUARDIAN OF VICTORY"**

AIR FORCES • GROUND FORCES • SERVICE FORCES



STOP DUST

It is no longer necessary to put up with a dirty room every time you sweep the floor. By sweeping with a Dustless brush, which makes its own sweeping compound as it sweeps, you can eliminate up to 97% of germ laden dust in the air between sweepings. You can also do away with costly sweeping compound and cut labor costs. Thousands of factories, shops, offices, schools, and stores now use Dustless sweeping. Get complete facts about this better method of dust control. Write today.



- Dustless
- Speed Sweep
- Speed Wash brushes

Dustless
DOES MORE FOR LESS

**MILWAUKEE DUSTLESS
BRUSH COMPANY**

528 N. 22nd Street • Milwaukee 3, Wisconsin

MEN WANTED!

GOOD MONEY NOW and a Bright POST-WAR FUTURE

Returning Veterans... office and factory workers... others! If you want to enjoy a FINE INCOME NOW, with even greater opportunities in the future, write us today! We are a nationally known manufacturer of Fire Fighting equipment... including "AUTOFYRSTOP," the amazing combination fire extinguisher and alarm that holds unequalled records. Our products sell FAST and in QUANTITIES to factories, schools, stores, homes. NO EXPERIENCE NEEDED. Write for FREE FACTS!

AUTOFYRSTOP CO., Dept. P-16, 2035 Washington Ave., Philadelphia 46, Pa.

ONLY
\$9.95



ENGINES IN STOCK

The G.H.Q. miniature gasoline engine that really operates is now available. Over 100,000 sold to date. 1/5 H.P. Complete with coil and condenser and full illustrated instructions for only \$9.95. Fully bench tested and ready to run. Power for all models. Send only \$1.00—Shipped Collect C.O.D. same day. Send for free illustrated Catalog of hundreds of hobby items.

GHQ MOTORS, Dept. SX16, Box 193, Sta. O, N.Y. 11, N.Y.

LAW

STUDY AT HOME for PERSONAL SUCCESS and LARGER EARNINGS. 36 years expert instruction—over 108,000 students enrolled. LL.B. Degree awarded. All texts furnished. Easy payments. Send for FREE BOOK "Law and Executive Guidance."

AMERICAN EXTENSION SCHOOL OF LAW
Dept. 61-S, 646 N. Michigan Ave., Chicago 11, Ill.

LENSSES

Buy them for a fraction of their original cost. U.S. Army and Navy surplus lenses and prisms. Send 3 cent stamp for list.

HOBBYIST LENS SET—Magnifiers, reducing lenses, positives, negatives, etc. 10 lens set.....ea. \$1.00
5X ACHROMATIC Telescope set.....ea. 1.50
BINOCULAR PRISM Erecting set.....ea. 2.00
ACHROMATIC OBJECTIVE 1 $\frac{1}{2}$ " Dia. 5" F. L.....ea. 1.50
EYE PIECE SET 1" Dia.ea. 1.50
SEND MONEY ORDER OR CHECK (NO C. O. D. ORDERS)
A. JAEGERS, 120-14B 115 Avenue

So. Ozone Park 20, N.Y.

ANYONE CAN DO THIS IF

THEY HAVE OUR CHART

Blue Print 27" x 36" shows how to find length of any rafter, find any angle in degrees, frame any polygon 3 to 16 sides, read board foot and brace tables, octagon scale, rafter tables and many other uses. Can be scaled down for model work as well as full scale framing. Also chart changing pitches to degrees for use with Radial Saws. Send 50c in coin or money order. No stamps or checks.

MASON & PARRISH ENGINEERS
2031-S N. Burdick St., Dept. B Kalamazoo 81, Michigan

SPECIAL OFFER FOR AGENTS

RELIEVE ITCHING DANDRUFF

MEN—do you suffer from dandruff which returns the day or so after you have washed your hair—simple method which takes only a few minutes of your time removes dandruff—no soap or cleaning agent used—results delightful—send 25c to cover instruction and mailing cost to Scalp Treatment, 148 Champion St., Battle Creek, Michigan—Please Print.

Now You Can be

TALLER
than "SHE" is!

Adler Elevator Shoes make you almost 2 INCHES TALLER, "Confidentially", and comfortably, the instant you put them on. Worn and praised by thousands. Look like any other stylish shoes—no high heels! Write for amazing catalog, mailed in plain wrapper. Adler, 122 E. 42nd St., New York 17, N.Y., Dept. PS-5.

QUICK WARMTH

FOR ROOMS WITH THE CHILLS!



WITTIE
PORTABLE
ELECTRIC Steam HEATER



Here is a miracle portable heater that provides *real steam heat!* It brings comfortable living to chilly rooms, recreation basements, summer homes and offices.

WITTIE Electric Steam Heater is safer; compact as streamline luggage; handsome as a piece of furniture, yet is light enough to carry anywhere. In "Fan Blow" and Convection models to suit your needs. Make a date to see these new, low price heaters. Send coupon today.

SPECIFICATIONS: $21\frac{1}{2} \times 17 \times 7\frac{3}{4}$ inches. Automatic Safety Shut-Off; 2-Stage Heat Regulator; No danger of fire or burn from glowing coils; costs but a few cents a day to operate; AC or DC. Three colors.

WITTIE MFG. & SALES CO.
Chicago 5, Ill.

WIT-EEZ
PRODUCT



WITTIE MFG. & SALES CO.
1414 S. Wabash Ave., Dept. 15, Chicago 5, Ill.

Please tell me when and where I can see the new WITTIE Portable Electric Steam Heater.

NAME _____

ADDRESS _____

CITY _____ STATE _____

VanRoy

with the new

Ajustomatic STEM



FREE-TURNING



SELF-ALIGNING

The one and only
Pipe of its kind

VanRoy Ajustomatic is more than just another screw-stem. It is a totally new kind of pipe. New—because the patented stem is "float-mounted"—accurately lines up with the bowl as straight as a die, always. The stem can be turned as often as you like—it will never lock at an off angle. Give yourself, or another, the proud satisfaction of owning this latest—and greatest—achievement in VanRoy pipes.



SIGNET OF QUALITY IN PIPES

VANROY COMPANY, INC., Empire State Building, New York 1

\$75,000 for boy **MODEL BUILDERS**

8 UNIVERSITY SCHOLARSHIPS

588 CASH AWARDS

36 CONVENTION TRIPS

Here's the biggest news you've read in a long time. You are eligible to try for these awards in the TWO competitions listed below—if you reside in the United States and are between the ages of 12 and 19 inclusive.

1. NAPOLEONIC COACH COMPETITION — 316 awards, including two \$5,000 and two \$3,000 scholarships. In this, you build a miniature model Napoleonic Coach to plans we furnish you.

2. MODEL CAR DESIGN COMPETITION — 316 awards, including two \$4,000 and two \$2,000 scholarships. All you do is make a solid model automobile embodying your own ideas of motor-car design.

Rules are simple and fair

In both competitions the following regulations will prevail. Boys 12 years old, or older, but not yet 16 by September 1, 1945, compete in the Junior Division. Boys 16 years old, or older, and not yet 20 on September 1, 1945, compete in the Senior Division. All boys within these age limits are eligible to Guild Membership. There are no dues or entrance fees of any kind. Each member shall receive, without charge, an official Guild membership card and button, and a full set of Guild drawings and instructions. Both competitions close July 15, 1946, and are open to all boys within the age limits, including the sons of General Motors employes. In all cases where the son of a General Motors employe qualifies for an award, duplicate awards will be made.

FISHER BODY CRAFTSMAN'S GUILD

An educational foundation sponsored by

Fisher Body Division of General Motors

General Motors Bldg., Detroit 2, Michigan

Gentlemen: Please enroll me in the Fisher Body Craftsman's Guild for 1946, in the

Napoleonic Coach Competition
 Model Car Design Competition

Send me full instructions without charge

Name _____

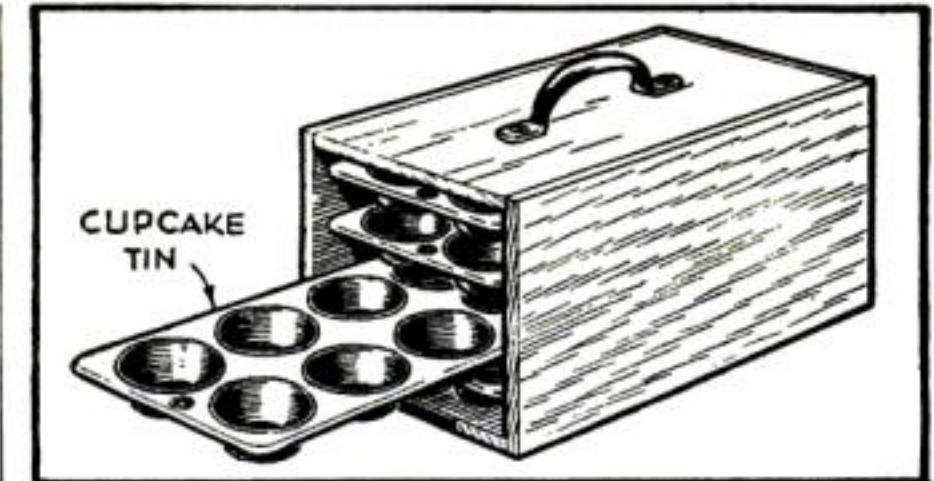
Address _____

City _____ Zone _____ State _____

I was born on the _____ day of _____ 19 _____

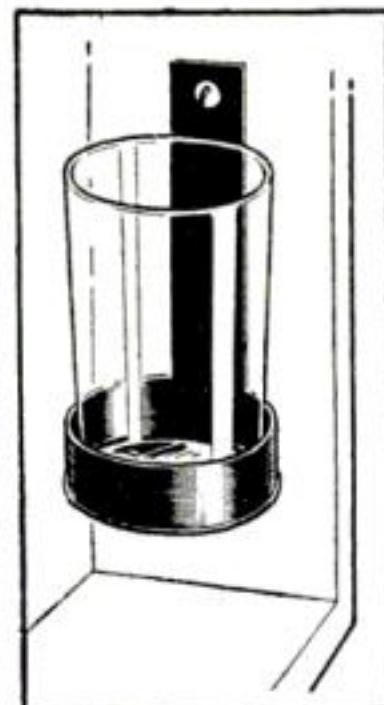
Name of parent or guardian _____

Dept. 40



CUPCAKE TINS PROVIDE STORAGE FOR VARIOUS SMALL PARTS

CUPCAKE tins slid like drawers into a wooden box provide convenient receptacles for storage of brads, washers, screws, and other small parts. Strong, nonwarping runners for the trays can be made from the flat type of metal curtain rods.—W. C. IRVING.

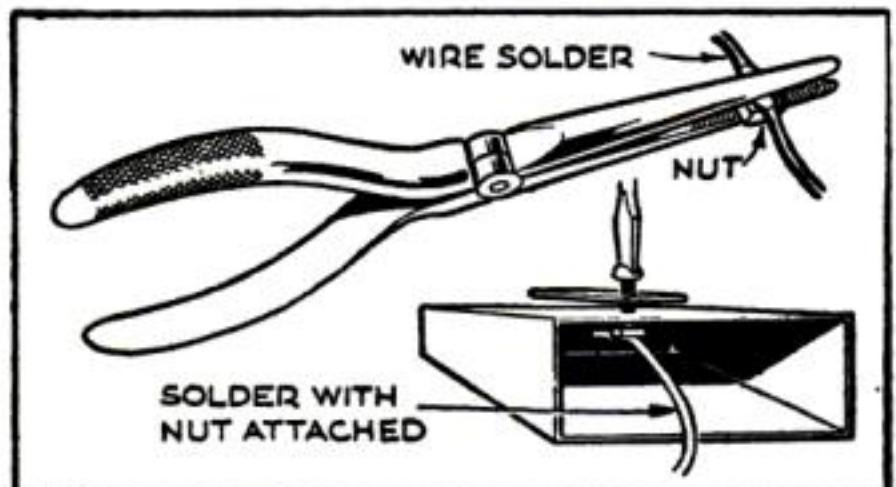


GLASS HOLDER FROM OLD CARTON

AN OLD ice cream carton, particularly one of small diameter, can be put to use by cutting it down as shown in the illustration at the left and tacking it inside the medicine chest to hold a glass. This also could be used in an emergency as a substitute for a regular glass holder.—E. S.

WIRE SOLDER SERVES AS FINGER TO HOLD NUT IN TIGHT SPOT

WHEN a nut must be started on a screw in a spot not easily accessible, squeeze a piece of wire solder against the face of the nut with a pair of pliers. Moderate pressure will engage the first thread with the wire. This will hold long enough to thrust the nut into place and get the screw started.—A. O.

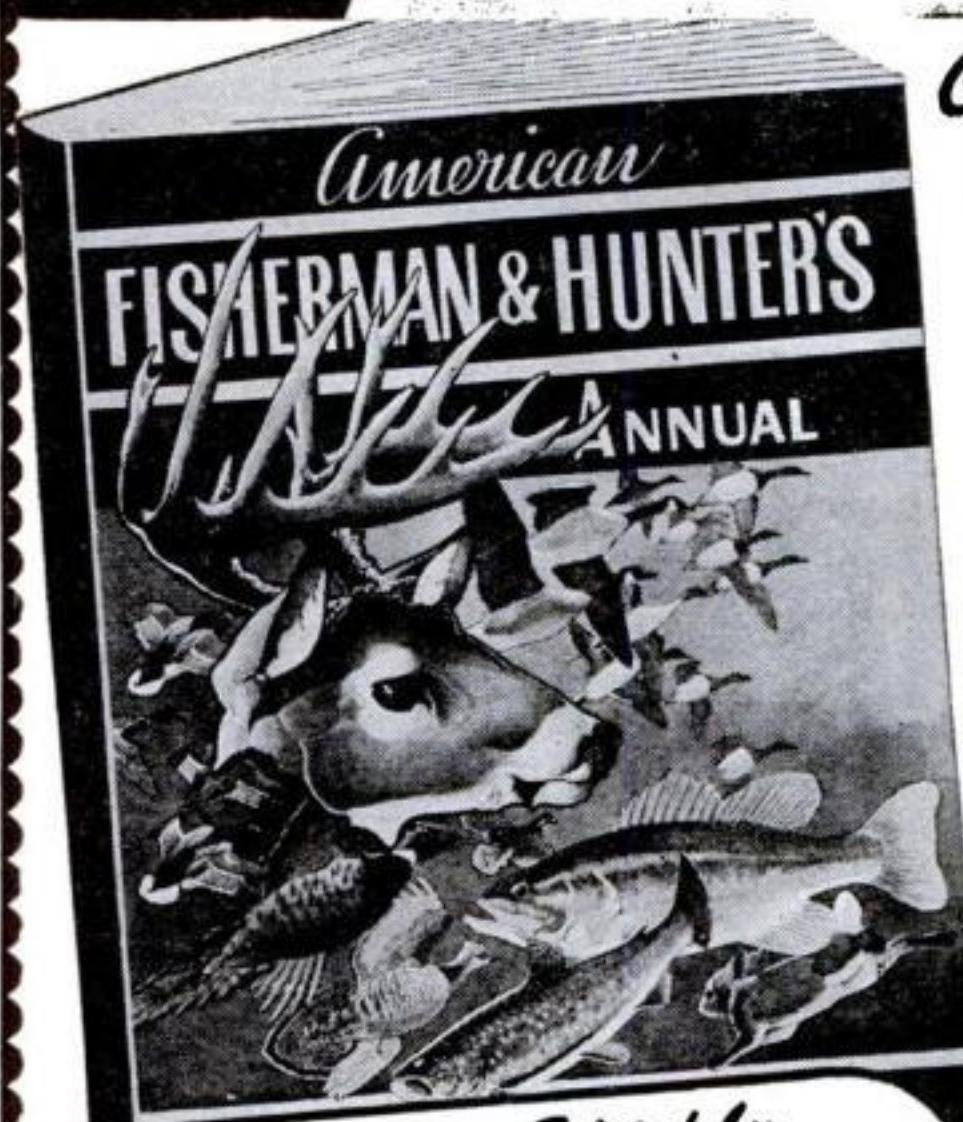


The favorite hunting and fishing spots

of America's leading Rod & Gun Editors!

Complete
in the New

AMERICAN FISHERMAN AND HUNTER'S ANNUAL



Edited by
DON STILLMAN



Don Stillman has been Rod and Gun Editor of the New York Herald-Tribune since 1930. He possesses that happy combination of the sportsman's skill and the writer's art. A born lover of the outdoors and a talented writer and editor, his background qualified him admirably for the task of producing this unusual Annual.

A NEW AND VALUABLE
SERVICE TO Every
REAL SPORTSMAN

The American Fisherman and Hunter's Annual is more than a book—it is a unique service. For here, at last, is the kind of "inside" information you've been looking for, a guide to the byways as well as the highways of better hunting and fishing; every fact presented by an on-the-spot expert! Don't miss this opportunity! Order your copy today. Lavishly illustrated.

PERIODICAL SALES CO., INC. DEPT. S
R.K.O. Bldg., Rockefeller Center 20, N. Y.

1946
EDITION

Now Ready

ONLY \$1

*Choice Spots WHERE YOU'LL FIND
BETTER HUNTING, KEENER FISHING*

Here, at last, is a sportsman's annual for outdoorsmen who are not content to travel well-beaten paths . . . who wish to learn of those "hidden" places known to ace fishermen and hunters. Thus, the WHERE TO GO section of this Big Annual is not just a routine list, but a REMARKABLE guide to the hunting and fishing spots selected by a leading rod and gun writer in each of the 48 states, Canada, Mexico and Alaska. Every listing, state by state, contains complete information—where to go for better fishing and hunting, who to contact, guide information, type of accommodations, and many other facts that will make your next trip the best you've ever had!

NUMEROUS SIDELIGHTS AND HIGH-LIGHTS ON HUNTING AND FISHING

In addition to its remarkably unique where-to-go section, The American Fisherman and Hunter's Annual contains a bonanza of feature and technical articles covering a wide variety of subjects close to the heart of the outdoorsman. Below is a brief list of these features—each written especially for this volume by a distinguished sportsman.

- "American Salt Water Angling" by S. Kip Farrington, Jr.
- "Hunting with the Camera" by Harold McCracken
- "Big Game Rifle" by Captain Charles Askins, Jr.
- "The Striped Bass" by Ray Camp
- "American Women Anglers" by Francesca La Mont
- "Florida and Bahamas Fishing" by Erl Roman
- "Western Duck Shooting" by H. L. Betten
- "Go Camping with Your Car" by Maurice H. Decker
- "Fishing Tackle" by Don Stillman
- "Trouble in the Woods" by Commander Eric H. Patterson
- "Selection of a Hunting Dog" by Nash Buckingham

The Most Authoritative Fishing and Hunting Information ever compiled for U. S., Canada, Mexico and Alaska!

PERIODICAL SALES CO., INC. DEPT. S
R.K.O. Bldg., Rockefeller Center, 20, N. Y.

I enclose \$1. Send me a copy of the 1946 edition of The American Fisherman and Hunter's Annual. It is understood that if I am not completely satisfied I may return the volume within 5 days and you will refund my money.

Name.....

Address.....

City..... Zone..... State.....

NOW! Enjoy Learning to Speak **SPANISH** AT HOME

FRENCH-GERMAN-ITALIAN

Big opportunities and jobs waiting for those who can speak Spanish. Millions of dollars being invested in Mexico, Central and South America—business and travel increasing every day. Now the ability to speak Spanish will mean more to you than ever before.



Only 15 Minutes a Day

The CORTINA METHOD, famous for OVER 60 YEARS, teaches you to speak Spanish LIKE A NATIVE. Right in your own home, relaxed and at ease, you learn as easily as a child learns—BY LISTENING to native instructors on these 30 new, easy-to-understand CORTINA recordings. EVERY WORD CLEAR AS A BELL.



Sent on 5 Days Approval

THOUSANDS have learned Spanish, this quick, easy way for PLEASURE and BUSINESS. Why not you? Free, 32-page book, "The Cortina Short-Cut," describes this famous method fully and tells how you can try it in your own home for 5 days. NO COST IF NOT DELIGHTED. Mail coupon for free book now.



Write Today-NOW!

CORTINA Academy (Established in 1882)
Dept. 121, 105 W. 40th St., New York 18, N. Y.

Please send me—without obligation—your free book.
I am interested in (check)

SPANISH French Italian German

Name.....

Address.....

City..... State.....

BUILD YOUR OWN RADIOS

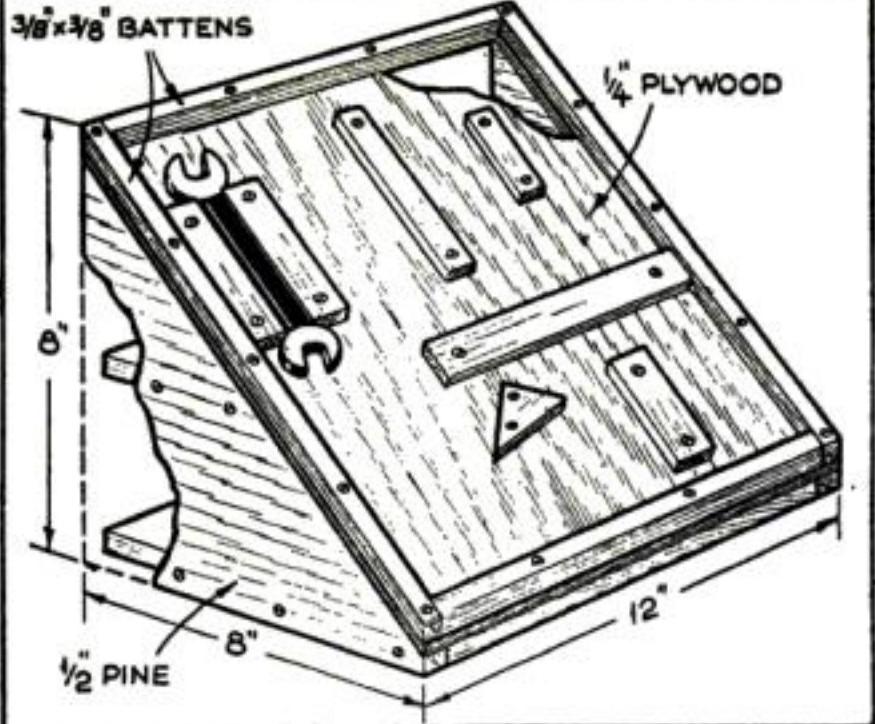
Kits of all sizes, ready to assemble. Complete with instructions.

FREE **RADIO PARTS CATALOG**
Send for your copy today!

Write for these exclusive items:
Tube and Circuit Book.....10c
Giant Radio Reference Map.....15c
Handy Tube-Base Calculator..25c

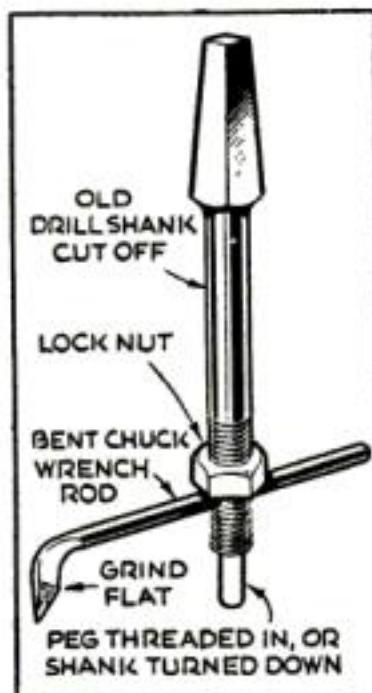
Address Lee, W9GFQ
Dept. PS-1, Council Bluffs, Iowa

Wholesale RADIO LABORATORIES



INCLINED PLYWOOD RACK HOLDS TOOLS NEATLY ON BENCH

WRENCHES, hammers, and tools frequently used can be kept at hand without cluttering up the bench where they interfere with work. The rack shown is fitted with strips that hold the tools in position. Outline each tool with pencil before attaching the strips. The batten at the top serves as a grip for carrying. An open back and shelves provide space for oil, steel wool, and other accessories.—KEN MURRAY.



TOOL CUTS OUT LARGE HOLES

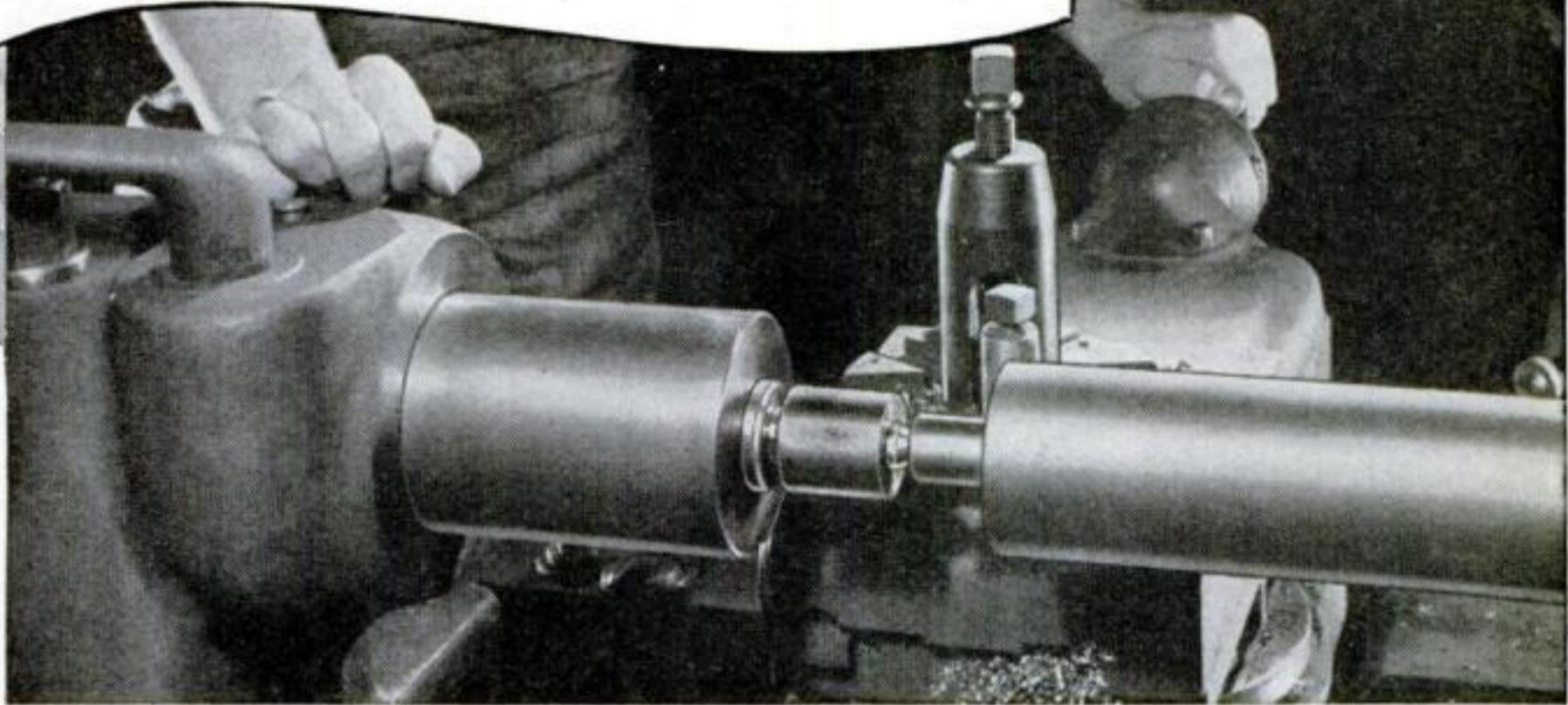
DIAL, meter, and socket holes can be made with this tool that cuts soft metal, hard rubber, plastic, and wood. An old drill shank is cut off, as indicated, and a hole is drilled in it for the cutting rod. It is threaded for a nut to lock the cutter at the radius needed for each job.—N. BOGOCH.

OIL HOLE IN CLOCK MECHANISM HELPS SILENCE NOISY GEARS

AN OLD electric clock of mine was growing noisy, but it wasn't worth a professional repair job. I knew from experience that taking the gear case apart was likely to lead to trouble, so I drilled a very small hole in the top of the case, added a few drops of watch oil, and closed the hole with sealing wax. The clock now runs as quietly as it did when new.—R. L. S.

Ingenious New Technical Methods

To Help You with Your Reconversion
Problems



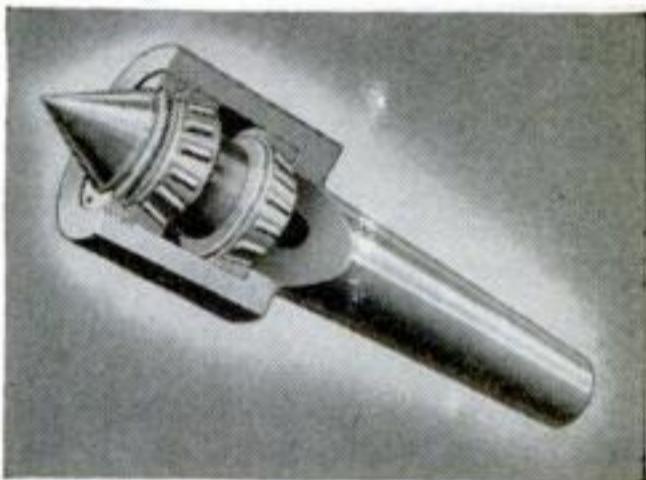
New Precision Built Roto Center Eliminates Chatter...Speeds Production!

Now You Can replace dead centers on lathe and grinder tailstocks, with this new Keene live Roto Center—to increase production—to eliminate all radial play and possibility of chatter! Low in cost, the Roto Center is a high capacity unit, featuring many innovations to speed and improve quality of work!

Matched roller bearings preloaded, are packed with high grade anti-friction grease at assembly. No attention is required for long periods. After assembly, runout is kept to absolute minimum—guaranteed less than .0002. Rear of center is tapped to receive standard hydraulic fitting. Chips, dust and cutting oil cannot reach bearings!

More and more peacetime "helps on the job" are returning to industry. One of these days, famous, flavorful Wrigley's Spearmint Gum will also be back to help you "on the job"—but only when we can assure Wrigley's Spearmint manufacture in *quantity* and *quality* for all. Today, we ask you to remember the famous Wrigley's Spearmint wrapper. Tomorrow, you may again enjoy Wrigley's Spearmint Gum quality and flavor while you are at work.

You can get complete information from
Keene Electrical Machinery Co., 549 W. Washington Blvd., Chicago 6, Ill.



The Keene Roto Center



Remember this wrapper

Z-97

BUILD the COMET INTERCEPTOR!



The GAS MODEL with the SENSATIONAL POST-WAR FEATURES!

Sensational GAS MODEL designed by CARL GOLDBERG! Offers amazing De-Thermalizer—which brings your model down out of rising air currents—prevents flying away! Foolproof automatic retractable landing gear; steep climb—graceful glide! Kit contains plans and materials to complete either Class "A" or "B" model.

Many other Comet Kits at your dealer

COMET MODEL AIRPLANE & SUPPLY CO. INC.

139 W. 39th STREET, CHICAGO 16, ILL.

1170 BROADWAY, NEW YORK 1, NEW YORK



Burpee's GIANT ZINNIAS

5 PACKETS **10¢**

Scarlet, Lavender, Yellow,

Rose and White—75c Value!

Giant 5-in. blooms, Dahlia-flowered. Sturdy 3-ft. plants, easy to grow. All five 15c Pkts., 1 of each color, postpaid for 10c! Send dime today.

Write for Burpee's Seed Catalog FREE.

W. ATLEE BURPEE CO. Philadelphia 32, Pa.

507 Burpee Bldg. (or) Clinton, Iowa

Send 5 Pkts. Giant Zinnia Seeds (No. 7588). Enclosed is 10c.



NAME _____

ST. OR R.D. _____

P.O. & STATE _____

Send Burpee's Seed Catalog FREE.

BUILD THIS TUG BOAT

KIT

\$7.50



Every landlocked sailor will enjoy building this tough

SEA GOING TUGBOAT for game room or study. Authentically detailed—14" long, 7" high. Completely shaped hull—simple to build. Add 25c for packing and shipping. Big catalogue only—10c. Address Dept. 8

MARINE MODEL CO., INC., 29 W. 15th St., N. Y. C.

For Sure Starting In Any Weather



WETSTART offers sure-fire protection for automobile ignition systems and batteries. Condensation, rain, even actual spraying will not keep your car from starting if you use WETSTART. Protects wiring insulation and makes ignition systems waterproof. To apply, simply brush WETSTART on all exposed ignition system wires and parts. Convenient 1-ounce size. For information write The General Detroit Corp., Dept. 13-F, 2272 East Jefferson Avenue, Detroit 7, Michigan.

FREE!! 40 PAGE HOBBY CATALOG

Over 1000 items — Over 300 Photos

Our new 40 page catalog is the "bible" of wide-awake modelers. Hundreds of models to choose from! Planes, engines, boats, jeeps, tanks, gliders, supplies, etc. Send for yours today!

AMERICA'S HOBBY CENTER

Dept. S16, 156 W. 22 St., N. Y. 11, N. Y.

HARLEY-DAVIDSON DAYS ARE HERE AGAIN!



More and more Harley-Davidsons are now going to dealers to meet demands of thousands of riders wanting the rugged dependability of "The World's Champion Motorcycles." For fullest enjoyment of exciting motorcycling events — get set to own a Harley-Davidson by seeing your dealer at once. Write today for FREE copy of "ENTHUSIAST" Magazine filled with thrilling motorcycle pictures and stories.

HARLEY-DAVIDSON MOTOR CO., Dept. PS, Milwaukee 1, Wis.

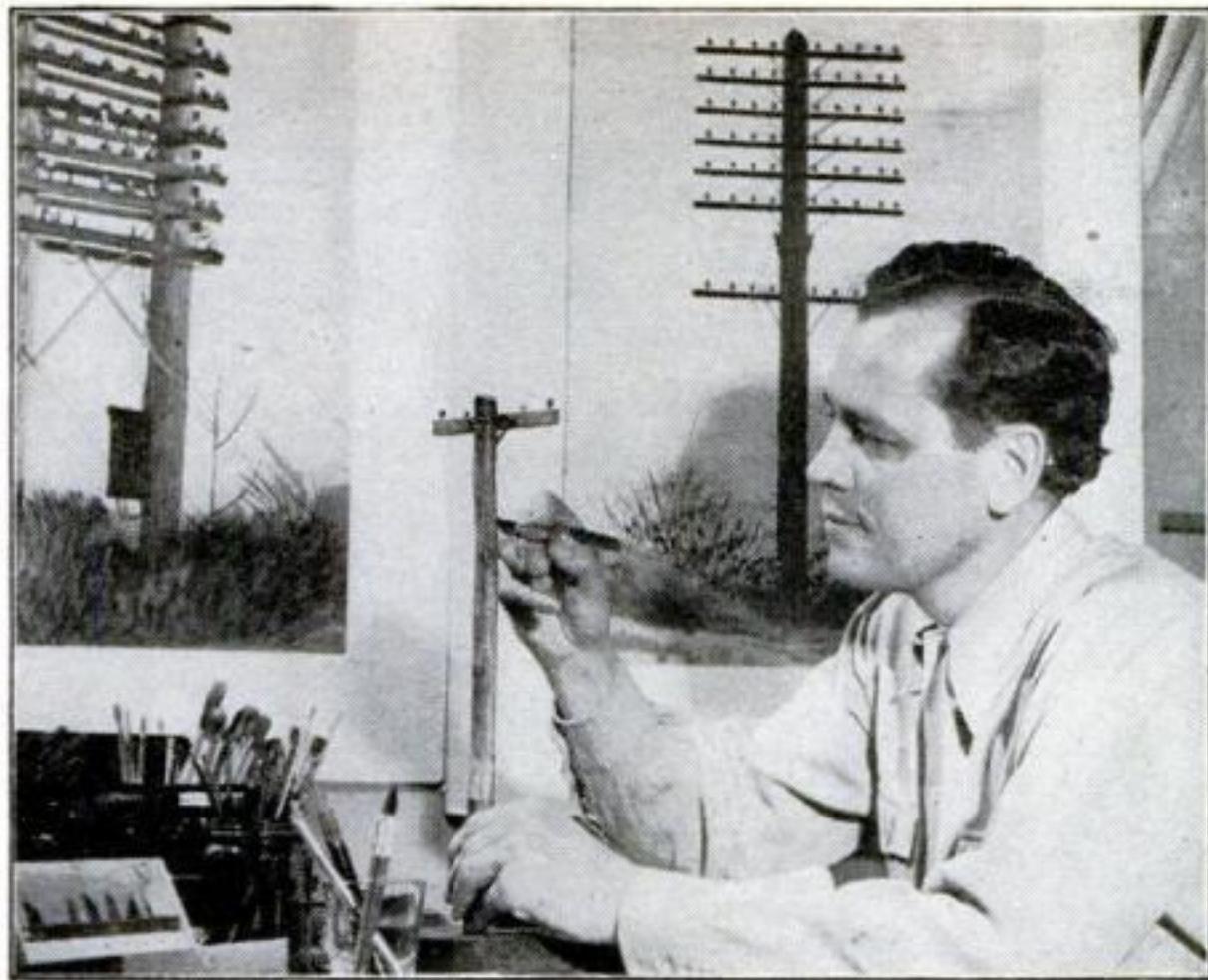


What holds with firmness, "peels" with ease;

What mounts rare stamps from Celebes?

Dennison
STAMP HINGES

At Stationery Departments Everywhere



"IT'S A SWELL LITTLE KIT!"

says Saturday Evening Post cover artist

Dohanos Uses X-acto Knives for His Work and for His Hobby

Of course you, and several million other Americans know and admire the handsome covers which Stevan Dohanos does for the Saturday Evening Post. But we bet not many of you knew before that lots of those scenes Mr. Dohanos paints are constructed in miniature first with the aid of his trusty X-acto Knife!

Mr. Dohanos has a talent for seeing beauty in the commonplace things around him. His special hobby is glorifying such simple objects as fire-plugs, telephone poles, and other characteristic ingredients of the American landscape.

Often (note the photograph above) Mr. Dohanos' hand-carved miniatures serve as subjects for his easel paintings. And this is where his X-acto Knives come in so handy, he says. They're sharp and easy-cutting, with

plenty of just-right blades for intricate detail work.

"I've used X-acto for years," says Stevan Dohanos, "for work and for fun. It's a swell little kit!"

Make Your Own Fun These Booklets Tell You How



Profusely illustrated. 32 pages. 10¢ each. Write direct to X-acto, at the address given below.

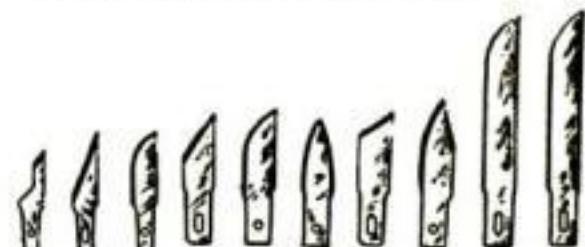
It's fun to make things yourself. And so easy with scalpel-sharp X-acto. Send for these two helpful booklets and enjoy the long winter evenings at home!

(1) How to Make Scale Model Planes

(2) Whittler's Handbook with patterns

ONLY X-ACTO KNIVES HAVE ALL THESE IMPORTANT ADVANTAGES

FIRST CHOICE of experts in hobbycraft and art fields. Indispensable tool for modelmaker's workshop.



10 BLADE SHAPES, interchangeable. All of scalpel-sharp surgical steel. A blade for every type of cutting job.



3 HANDLE STYLES, of solid duraluminum construction. Designed for safety, firm grip, precise control.



INGENIOUS COLLET DEVICE locks in blades securely, so they can't fold under on curves or heavy cuts.



CHANGE BLADES in about 5 seconds. A twist, a twirl, and there! X-acto's always sharp, always ready.



KNIFE OF MYRIAD USES. Cuts paper, leather, wood or plastics easily. Ideal for modelmakers, artists, photographers, wood carvers, taxidermists. New uses every day.



x-acto^{*} KNIVES & TOOLS

X-acto Knives & Knife Chests From 50c to \$5.00

Buy where you see this sign. At better hardware, hobby and gift shops
— or if not available write direct to

X-acto Crescent Products Co., Inc., 440 Fourth Avenue, New York 16, N. Y.

*Reg. U.S. Pat. Off.

WANT YOUR OWN BUSINESS?

Pensacola Offers Exceptional Opportunities for Small Industries . . .

Mahogany for novelties and souvenirs, plenty of raw materials for candy manufacturers and peanut processors, brooms and brushes, fine furniture and cabinet-making and many other industries are immediately available. You can count on the full cooperation of the community and its established industries. Taxes are low.

If you want to strike out on your own, starting small in a location where you can grow big, write today telling us your requirements.

INDUSTRIAL DEVELOPMENT DIVISION...
MUNICIPAL ADVERTISING BOARD **PENSACOLA** Florida

This is the way, to Make Money!

MACHINE SAW FILING with the Foley Automatic Saw filer is the modern way to recondition saws. Anyone can do the work—no experience needed—no eye-strain. Start in spare time—Foley-filed saws cut so smooth and fast, they will advertise for you, bring you new customers and a steady repeat cash business.

The Foley is the ONLY machine that files all hand saws, also band and cross-cut circular saws,—enables you to handle work from schools, shops and factories as well as farmers, carpenters, etc.

Send for FREE PLAN

Shows how to start—no canvassing. Send coupon today.



FOLEY Automatic SAW FILER

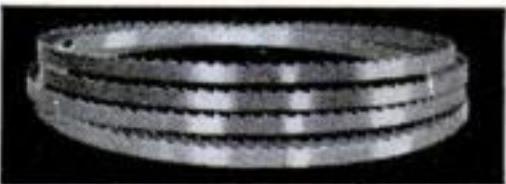
FOLEY MANUFACTURING CO.
119-6 Foley Bldg., Minneapolis 13, Minnesota
Send Free Plan on Saw Filing business, no obligation

Name _____
Address _____

Electrically Welded Endless

Paramount

BAND
SAW
BLADES



Made in widths from $\frac{1}{8}$ " to $1\frac{1}{4}$ "

Make your band saw do more work for you. The proper width of blade will extend the scope of this important machine. Burrill's Paramount Blades are made from tough Nickel Alloy Steel properly tempered. Teeth accurately set and filed, and all saws carefully straightened. Send order and check today. Delivery will be made as promptly as war conditions permit, from a few days to a week or two. You can obtain these saws at the following prices:

$\frac{1}{8}$ "-3/16"- $\frac{1}{4}$ "- $\frac{3}{8}$ " wide, 5'6" long.....	\$.90 each
$\frac{1}{8}$ "-3/16"- $\frac{1}{4}$ "- $\frac{3}{8}$ " wide, 6'6" long.....	.95 each
$\frac{1}{8}$ "-3/16"- $\frac{1}{4}$ "- $\frac{3}{8}$ " wide, 7'6" long.....	1.10 each

Other sizes at proportional prices

Your satisfaction is guaranteed

BURRILL SAW & TOOL WORKS
405 E. Main St., Ilion, N.Y.

Soon

THE WORLD'S SAFEST ELECTRIC JIG SAWS will again carry the name:

SYNCRON

SYNCRO DEVICES, INC.
FERNDALE 20, MICHIGAN

NEW! Sell Popular
ALL WOOL
Buffalo Check Shirt -



Every Outdoor
Man a Prospect. Smartest
color and style combined with
warm snug comfort. Genuine
ALL WOOL Buffalo Check Shirt, full
cut, patented storm cuffs. Amazingly low
priced, with generous profit for you.

COMPLETE LINE
Leather and wool jackets, raincoats, 200
fast-selling shoe styles. Our salesmen
making biggest profits using Actual Sam-
ples we furnish FREE. Write TODAY!

MASON SHOE MANUFACTURING COMPANY
Dept. M-335 Chippewa Falls, Wisconsin

BACKACHE, LEG PAINS MAY BE DANGER SIGN

Of Tired Kidneys

If backache and leg pains are making you miserable, don't just complain and do nothing about them. Nature may be warning you that your kidneys need attention.

The kidneys are Nature's chief way of taking excess acids and poisonous waste out of the blood. They help most people pass about 3 pints a day.

If the 15 miles of kidney tubes and filters don't work well, poisonous waste matter stays in the blood. These poisons may start nagging backaches, rheumatic pains, leg pains, loss of pep and energy, getting up nights, swelling, puffiness under the eyes, headaches and dizziness.

Don't wait! Ask your druggist for Doan's Pills, a stimulant diuretic, used successfully by millions for over 40 years. Doan's give happy relief and will help the 15 miles of kidney tubes flush out poisonous waste from the blood. Get Doan's Pills.



Making Music THE THRILL OF A LIFETIME!

A makeshift bandstand...a group of happy youngsters...and Conn band instruments—perfect combination for *the thrill of a lifetime*, MAKING MUSIC! Age is no handicap—neither is it an advantage. Anyone who can whistle a tune can play a wind instrument!

Making music yourself is so much more fun, so much more thrilling, than listening to others. It provides a satisfaction unsurpassed by any other single activity...and it helps relax the mind and body! If you have never experienced this thrill, if you have never played a wind instrument—find out now how *you* can enjoy it—how *easy* it is! Send for FREE Books, shown at right. C. G. CONN LTD., ELKHART, INDIANA.

1913

Write... FOR FREE BOOKS

TEEN-AGERS—Ask for "Fun and Popularity Through Music." Ideas and examples, how *you* can enjoy advantages and opportunities which playing a wind instrument provides.

PARENTS—Ask for "Music, The Emotional Outlet for Youth." An important guide for growing children that is widely acclaimed by authorities on youth problems.

See your friendly Conn dealer, or send coupon direct to C. G. Conn Ltd., Elkhart, Indiana.



C. G. CONN LTD.,
132 Conn Building, Elkhart, Indiana.

Without obligation, please send FREE Book checked below.

- "Fun and Popularity Through Music"
 "Music, The Emotional Outlet for Youth"

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____



WORLD'S LARGEST MANUFACTURERS OF BAND INSTRUMENTS

Men Who Make Things SAY:



KEEP THIS HANDY!
you'll find it
helps in no end
of ways

In any type of homecraft, there's no limit to the things you can do with Durham's Rock-Hard Water Putty, the modern powdered plastic. Molds fascinating figures. Fills chipped places in antiques. Makes lasting repairs in wood, plaster, tile or similar material. Keeps indefinitely. So economical—just mix with water, and it's ready to use. Hardens quickly—then you can saw it, chisel it, paint it.

Most patching materials may shrink, chip off or fall out. But Durham's Rock-Hard Water Putty does not shrink. It sticks and stays put. Order from your lumber, hardware or paint dealer.

SPECIAL — 4 lb. can only \$1

To home craftsmen, we will send the big 4-pound can, postpaid anywhere in U. S. for only \$1. So many helpful ways to use it. We guarantee complete satisfaction or refund every cent of your money. Order today. Donald Durham Co., 244 School St., Des Moines, Iowa.

MONEY-SAVING OFFER- ORDER NOW

EARN BIG MONEY BE AN ARTIST



Now you really can TEACH YOURSELF to be an artist with the help of one of the country's leading art directors—draw and paint for magazines, advertisements, calendars, etc. Big money, pleasant work. Cartooning, Pen & Ink Illustration, Figure Drawing, Water Color, Perspective, Oil Painting.

Complete in 5 books.
ONLY ONE DOLLAR

Genuine Hollywood models are shown in glamorous art poses.
Over 100 illustrations.

MONEY BACK GUARANTEE! Fill out coupon, enclose in envelope with one dollar bill or money order, and mail to

HOLLYWOOD ARTISTS
P.O. Box 2344, Hollywood, Calif.

PSI-1

NAME _____

ADDRESS _____

CITY _____ STATE _____

COMPLETE COURSE POSTPAID \$1.00

READY CUT HOMES

Order Now

Homes \$1182.00 and up, freight paid. Orders filled in least on modern production method homes. Much more compared with builders' prices. Anyone can assemble with simple plans furnished. Complete including paint, hardware, roofing, glass, nails, etc. Send 25c in coin for full color catalogue showing 56 modern low-priced homes and floor plans. Complete building plans ready for filing at low cost.

Dept. PS-16

INTERNATIONAL MILL
& TIMBER CO.
Bay City,
Mich.

NEW COLOR CATALOG
FOR ONLY
25¢



DIE-LESS DUPLICATING

Many small parts can be formed without dies, to duplicated accuracy of .001" with DI-ACRO Precision Machines. — Benders, Brakes, Shears. Save die expense and time delay. Ideal for experimental and research work, making samples, models, etc. as well as regular production runs. Write for descriptive literature.

O'NEIL-IRWIN MFG. COMPANY

342 8th Ave. South, Minneapolis 15, Minn.



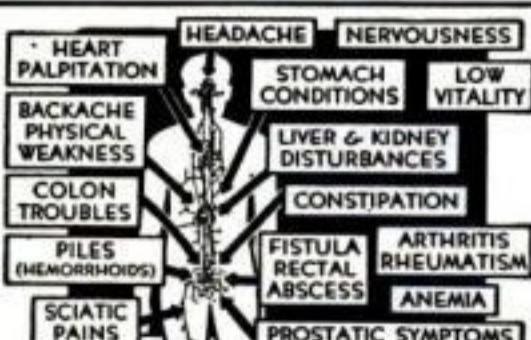
SAVES
BARBER BILLS

Trims hair as it combs! Easy! Quick! Keeps men's, women's children's hair trim, neat, freshly-cut looking all the time! Trims, tapers, thins out uneven hair. Use like ordinary comb. Safe. Simple. No experience required. Fine for legs, underarms! Sells like wild! SAMPLES FOR AGENTS Samples offer sent immediately to all who send name at once. A penny postal will do. SEND NO MONEY. Just your name. KRISTEE CO., 691 Bar St., AKRON, OHIO

I'LL GIVE YOU A NEW, FAST MIND

My MIND-STIMULATOR wakes up new Powers in your Mind to THINK-UP New Money-Making Ideas; helps you FIND YOURSELF...the REAL YOU, Your Right Vocation. Hidden Opportunities and Earning-Power for Quickest Financial Success. Write Dr. Tibolt 41A Phila. 20

FISTULA FREE BOOK-Explains Facts



Fistula, Rectal Abscess, Piles and other rectal and colon disorders are dangerous. A new 40-page FREE BOOK explains corrective treatment. Write today. Thornton & Minor Clinic, Suite 149, 926 McGee St., Kansas City, Mo.

POPULAR SCIENCE



Priced so all can enjoy the **FUN OF ENLARGING**. Now, as in pre-war days, Federal sets the standard of value in enlargers. From lens to lamp house, the Federal is a quality enlarger embodying advanced mechanical and optical features, many unobtainable in higher priced enlargers. The Federal is a marvel for ease of operation...produces magnificent prints with a minimum of experience.

"ENLARGING IS THRILLING"

— a delightful, down-to-earth book. Strips the mystery from enlarging. Entertains as it explains in simple easy-to-follow language. Illustrated by the author, don herold. Says Keppler, "It's a Gem!"

25c at Camera Stores Everywhere
or Send Coin, Check, Money Order to



FEDERAL MANUFACTURING & ENGINEERING CORP.
Makers of Photographic & Electronic Devices
209 STEUBEN ST. • BROOKLYN 5, N.Y.

NEW WRITERS WANTED

FREE

DETAILS
NO OBLIGATION.

New writers needed to re-write ideas in newspapers, magazines and books. Splendid opportunity to "break-into" fascinating writing field. May bring you up to \$5.00 per hour spare time. Experience unnecessary. Write today for FREE details. Postcard will do.

COMFORT WRITER'S SERVICE

200-T41 South Seventh (2)

St. Louis, Mo.

THE NEON GLOW

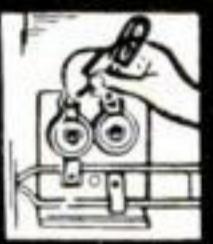
... LOCATES TROUBLE

INSTANTLY in electric circuits, fuses, cut-outs, motors, radios, appliances. Tests everything electrical from 100 to 550 volts. Indicates hot or grounded wires. Tells AC from DC. Engineers prefer it because it has patented safety features.

PUTS "FINGER" ON THE TROUBLE SPOT -- QUICKLY

Far superior to ordinary clumsy test bulb. Saves precious time. Indispensable in shop or home. Vest pocket size. Lifetime guarantee. List \$1.50 (Pat. No. 1,778,883). Purchase through regular electrical dealers.

L.S. BRACH MFG. CORP.
200 Central Ave. Newark, N.J.



FUSES



MOTORS



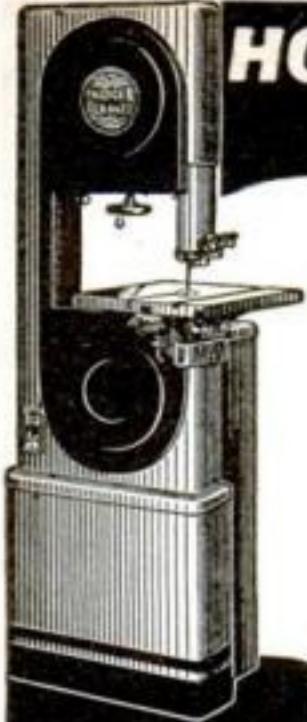
OUTLETS



FOR
PORTABLE RADIOS

BURGESS BATTERIES

RECOGNIZED BY THEIR
STRIPES • REMEMBERED
BY THEIR SERVICE



HOW TO OBTAIN SHOP TOOLS

at the earliest possible moment and
**PAY FOR THEM OUT OF
PATRIOTIC SAVINGS
IN WAR BONDS**

Own versatile, low-cost, sturdy
Boice-Crane
Band Saws - Saw Jointers
Jig Saws - Spindle Shapers
Belt Sanders - Spindle Sanders
Drill Presses - Lathes
Thickness Planers

Write today for folder on the

**Boice
Crane**

PURCHASE PRIORITY PLAN

a safe, convenient plan for forward-looking shop men and home craftsmen. True, government priority restrictions are removed, but civilian power tool delivery delays will continue to exist for many months. You can avoid prolonged waiting for your tools, or the necessity of buying something less satisfactory, by reserving a preferred delivery position now. Use this convenient coupon to get details.

**BOICE-CRANE CO.
944 Central Ave., Toledo, Ohio**

Please send, without obligation or cost, details of the Boice-Crane Purchase Priority Plan, together with a copy of your catalog on shop tools.

NAME _____
STREET _____
CITY _____

SMALL HOLE MEASURING TOOLS

Measure All Holes, Slots, Etc.—3/32 to 5/16 Inch. Gives You Outside Micrometer Accuracy on Inside Measurements. Finished Set of Three Hardened and Ground Tools

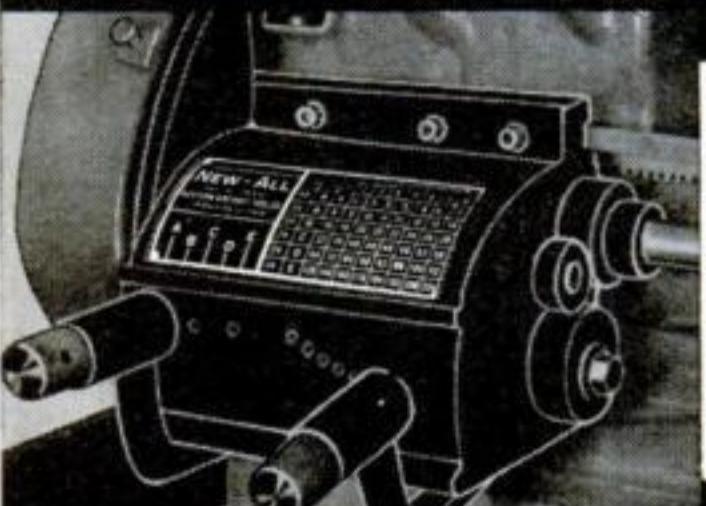


Only \$2.95 C.O.D.

Plus Usual Postal Charge

ALCO SHOPS, Dept. L, 1459 Sunset Blvd., Los Angeles 26, California

NEW IMPROVED MODEL!



30-DAY Money-Back Guarantee!

NEW-ALL QUICK CHANGE GEAR BOX
Increases Production up to 1000%

PAYS FOR ITSELF IN 30 DAYS! Sold Under 30-Day Money-Back Guarantee
GUARANTEED ACCURACY! Is guaranteed to cut accurate threads from 4 to 224 per inch with approximately 3/1000 feed for fine turning. It safeguards entire production in process throughout the complete operation.

DRASTICALLY CUTS LABOR COSTS! No time lost finding gears. Inexperienced workmen easily produce top output. Easy to install. You simply drill and tap four holes.

PRECISION CONSTRUCTED! Precision constructed throughout with gears of quality hobbed steel. Gear Box housing is made of high grade aluminum alloy casting—with replaceable bronze bearings.

**NEW LOW PRICE . . . \$75.00 F.O.B. Los Angeles
For Logan, Powercraft, Atlas and Craftsman
You Can Use Your Own Lead Screw.**

WESTERN AIRCRAFT TOOL CO.
650 No. Hoover St. Los Angeles 4, Calif. NOrmandy 2-4711



USE OUR
CAPITAL

NO SALES EXPERIENCE NEEDED

The biggest opportunity ever, to quickly establish a money-making, lifetime business, now awaits you as a McNess Dealer. Sell things farmers need and use up. Serve same families year after year. Pleasant work--no bosses--easy to do. We supply capital to work on. Also provide offers--advertising--premiums and trade secrets that bring sales.

First to apply get best trading areas. Don't wait--write us today for McNess proposition. Tell us county and state you want to serve. Ask for free McNess Book.

THE McNESS CO., 152 Adams St., Freeport, Ill.



**Maule's GIANT
Asters** 5 Packets
10¢

RED, WHITE,
BLUE, PINK,
PURPLE

Wilt-Resistant!

Favorites all over America! 5 choicest colors, a full-size 15c-Packet of seeds of each, all 5 sent postpaid to you for only 10c--to get acquainted. Send dime today!

Maule's Seed Book Free--Tested, guaranteed seeds; all best flowers and vegetables, for bumper crops. The Old Reliable Seed House.

WM. HENRY MAULE
156 Maule Building, Philadelphia 32, Pa.
(in the west) 156 Maule Building, Clinton, Iowa



RFTER LENGTHS. A new vest pocket book for the carpenter, estimator. Gives lengths, Side cuts, Plumb cuts. Deductions. For all your rafters to fit any building from one inch wide to forty feet wide. Gives the numbers to cut on the square. Also gives degrees for same cuts for Radial Saws. All standard pitches from $1\frac{1}{8}$ to $3\frac{1}{8}$ are given. Just open book to pitch page and there in plain print are your lengths, side cuts, etc. Any one who knows what a Jack rafter is can frame a roof correctly if he has this great book. Price one dollar, prepaid.

BUILDERS' TOPICS. Dept. S, Med. Arts Bldg., Seattle 1, Wash. Original teachers of the square in five easy lessons, by mail. Send for FREE list of plan books—Kamp Cabins to Mansions.

LATHE OWNERS

CONVERT YOUR LATHE INTO A PRECISION MILLING MACHINE IN LESS THAN THREE MINUTES!



GLOBE HEAVY DUTY BED TURRETS—Adaptable to any lathe 4½" travel. Precision built. Rugged construction.

BORING BAR HOLDERS AND BORING BARS

(Formerly known as the "Clayton")

OUTSTANDING FEATURES BORING BAR HOLDER: Duplicate Operations

Boring Bar Holder can be removed from lathe without affecting Boring Bar setting. Identical set-up may be retained for later duplicate operations.

Save Set-up Time

Bars can be changed, tool bits raised or lowered, distances lengthened or shortened between the tool bit and the body of the holder—all without disturbing the alignment of the holder with the lathe.

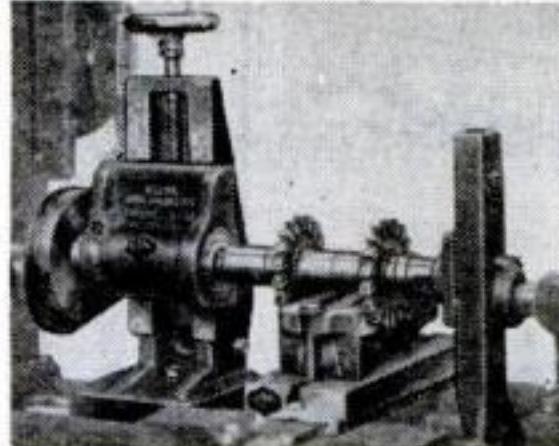
Speed Production

Boring Bar of any fractional size (within capacity of Holder) is instantly centered and clamped without sleeves or fingering adjustment of center post.

OUTSTANDING FEATURES GLOBE BORING BAR: $\frac{1}{4}$ " calibration markings assist settings, minimize vibration, permit heavier cuts.

Send Coupon for Free Bulletin and Prices.

GLOBE PRODUCTS MANUFACTURING CO.
3380 ROBERTSON BOULEVARD • LOS ANGELES 34, CALIF.



USED EXTENSIVELY BY U. S. GOVERNMENT AS PART OF MOBILE REPAIR TRUCK STANDARD EQUIPMENT

Costing a fraction as much as a standard miller, the Globe can perform practically any milling operation, using your lathe motor through headstock as the source of power, and employing all the speeds and feeds of the lathe.

**Gang Milling Slot Cutting —and Many Other
Facing Cutting Keyways Milling
Gear Cutting Operations**

AUTOMOTIVE REPAIR MEN!

A profitable source of new revenue is open to you with the Globe Miller in the trueing of truck and passenger car brake drums. For example, it increases the swing of an 11" lathe to 19½", large enough for truck brake drums. Write for particulars today.

SEND COUPON FOR INFORMATION ON HOW YOUR LATHE CAN BE A PRECISION MILLING MACHINE, TOO

GLOBE PRODUCTS MFG. CO. DEPT. A-5

3380 Robertson Blvd., Los Angeles 34, Calif.

Send me bulletins on:

- Globe Miller Globe Cross Slide
 Globe Heavy Duty Bed Turrets

My lathe is _____ (MAKE) (MODEL) (SWING)

It has power Hand cross feed. — Equipped with telescoping taper attachment — yes no -?

- Globe Boring Bar Holders
 Globe Milling Vise and Dividing Heads

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____



TURN YOUR SPARE TIME INTO PROFITS!

No Experience Required • Light, Clean Work

Steady, Profitable Income

Be Your Own Boss

Work Right In Your Own Home

Here's the way to make big profits in your own business!

Clean, easy work that pays *all* the profits to you. Without any experience, you can quickly learn to operate the Ideal Lawnmower Sharpener right in your own home, or as a sideline in your shop or garage. Automatic operation assures a perfect job every time. Just place mower in sharpener, make a few simple adjustments and the machine does the rest!

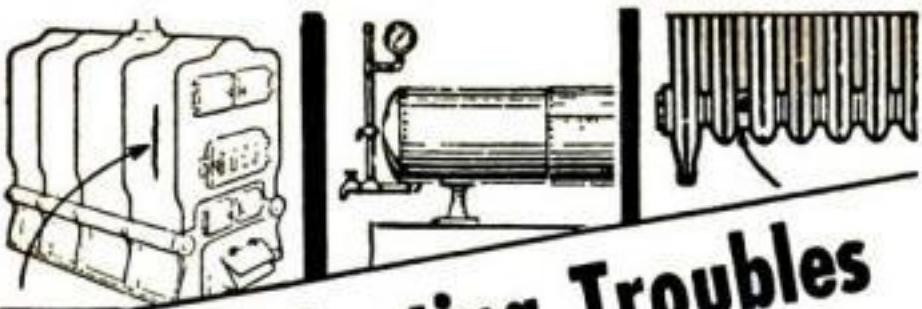
The Ideal Sharpener takes any make or size hand lawnmower. Every community needs this service. Work as long as you like . . . you're the boss, running your own business. Make those evenings at home pay cash profits now. Write today for complete information, without obligation.



THE FATE-ROOT-HEATH CO. • 2146 Bell St. Plymouth, Ohio

SEND FOR THIS FREE BOOK!

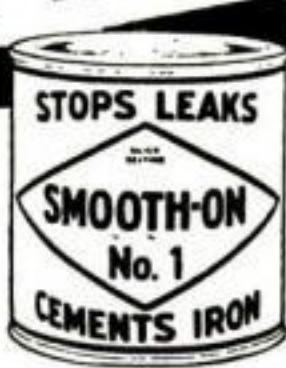
**"HOW TO BUILD
A PROFITABLE BUSINESS
OF YOUR OWN"**



Avoid Heating Troubles Later—by using **SMOOTH-ON NOW**

DON'T wait for those leaks or cracks in boiler, furnace, tank, radiators, piping to develop into real trouble. Repair them now—with Smooth-On No. 1 Iron Repair Cement.

Easy to use—no heat required. Inexpensive. Makes tight, lasting repairs that do not work loose, for Smooth-On expands slightly as it sets. Useful in dozens of ways around house, garage, shop. Tightens loose parts, fixtures, casters, handles, knobs, etc. Also stops leaks in pumps, tanks, auto radiators, etc. Get Smooth-On in 1½-oz., 7-oz., or larger containers at your neighborhood hardware store or, if necessary, from us.



**40-PAGE
REPAIR HANDBOOK FREE**



Tested, easy-to-follow, short-cut directions for making dozens of repairs around the house, car and shop. 170 diagrams. Pocket size. Conveniently indexed. Send the coupon.

Smooth-On Manufacturing Co., Dept. 58
570 Communipaw Ave., Jersey City 4, N. J.
Please send the FREE Smooth-On Repair Handbook.

Name.....

Address.....

1-46.....

Do it with SMOOTH-ON



"It saves all the clutter of kindling."

Waxed Knife Cuts Without Binding



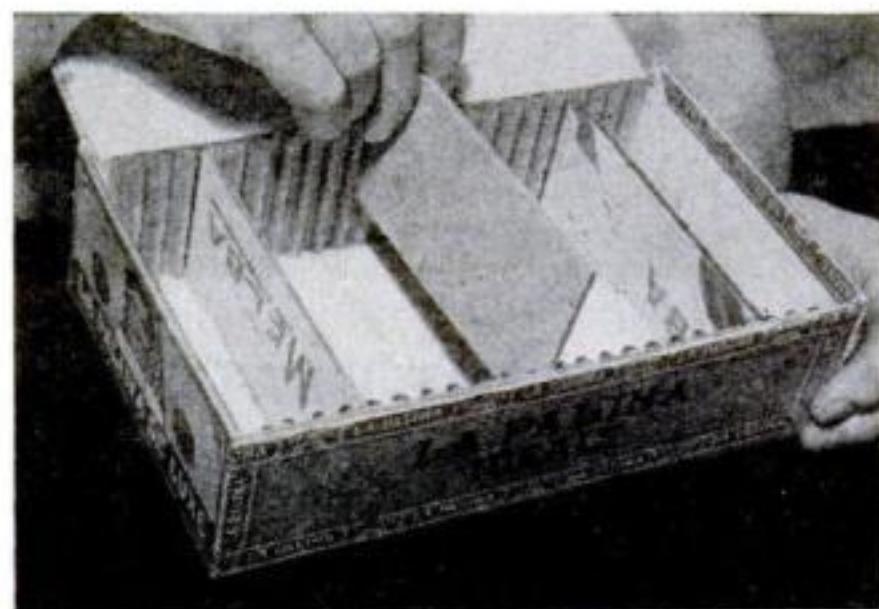
WHEN cutting up cardboard cartons for paper salvage, you can prevent the blade of your knife from binding by keeping it waxed. A candle stub, kept handy on the cutting area, will serve for this.—J. MODROCH.

Reducing Coal Dust in the Cellar

PAPERING the outside walls of your coal bin with heavy wrapping paper will help to prevent the spread of coal dust through the lower part of the house. Thumbtack large sheets of used paper liberally over the outside planking of the bin. Make sure that all sheets overlap and that no spaces are left between them.—ROGER WOODBURY.

Movable Partitions Fitted in Box

ADJUSTABLE partitions can be provided in a cigar box or other small container by use of corrugated strips cemented to the interior faces of two sides. The partitions, of course, must be the proper thickness to fit tightly into the grooves.—H. KLEIN.



Most makes of power tools look alike — but . . .
advanced engineering features of
DELTA-MILWAUKEE POWER TOOLS
mean greater operating satisfaction

1 Lubricated-for-life Ball Bearings. You don't have to worry about oiling these bearings — they're lubricated for life when they leave the factory. And they are double-sealed against harmful dust, to assure you of longer bearing life.

2 Pre-loaded Bearings. This is the result of an extra manufacturing operation that reduces the "play" in the bearings, to help you enjoy long-time operating efficiency and accuracy.

3 Precision-bored Bearing Seats. These bearing seats help keep all parts lined up properly, so that you have greater assurance of producing finished pieces exactly according to dimensions.

4 Precision-ground Shafts. These are shafts built to run without any "wobbling" which might throw off your measurements.

5 Dynamically-balanced Pulleys. The pulleys which transmit the power from your motor to your power tool are balanced to help eliminate annoying, damaging vibration.

Ask your Delta dealer to let you know when he receives his first shipment of these famous power tools. Then, see how they are built to help assure you of accuracy, dependability, safety, economy. Or place your order with your dealer now, so that you can be among those to receive delivery at the earliest moment.

A Whole Year of Woodworking Fun, Projects, and Ideas

for
only

50¢

... in **THE Deltagram**

... the popular, plan-packed homecrafters' magazine

Delivered to your home six times a year. Page after page of fascinating, shop-tested plans and projects helpful in producing beautiful objects your friends admire. Ideas, news, shop tips on performing woodworking operations more easily, more quickly, more safely. Crystal-clear, step-by-step instructions in

words and pictures.

The new subscription year for The Deltagram has just started. By subscribing right now, you're still in time to receive the first new issue. Fill out the coupon below and mail it today with coin, postal note, or money order. Only 50¢ for all six exciting issues!



TEAR OUT COUPON AND MAIL TODAY!

THE DELTA MANUFACTURING COMPANY
683A E. Vienna Avenue, Milwaukee 1, Wisconsin

Enclosed is 50¢ in payment for a full year's subscription to The Deltagram.

Name.....

Address.....

City.....

(...) State.....



**ORDER
NOW!**

NEW

ECHOPHONE EC-1A RADIO RECEIVER

Be one of the first to own this popular set for short-wave and regular broadcast reception. Order now for earliest delivery. Many new features! Covers entire tuning range from 550 Kc. to 30 Mc. (550 to 9.85 meters) in 3 bands. For 110-125 volts AC-DC Automatic noise limiter. Built-in PM speaker Complete with tubes.

Net, F.O.B. Chicago

\$2950

ALLIED RADIO CORP.

833 W Jackson Blvd., Dept 7-AA-6, Chicago 7, Ill.

- Ship ECHOPHONE EC-1A at earliest moment.
- Enclosed \$ Full Payment
- Send additional information on Echophone EC-1A.
- Send information on other Communications Receivers and Time Payment Plan, without obligation.

Name.....

Address.....

City.....

Zone..... State.....

HULL AUTO COMPASS

Security of direction makes driving enjoyable. **HULL STREAMLINE AUTO COMPASS** keeps you headed right. No wrong turns. Accurate. Sturdy. Write for literature. Price \$3.50.

HULL MFG. CO.

P.O. Box 246-E2

Warren, Ohio



HOME INDUSTRY OPPORTUNITIES



Make Good Door Mats from Old Tires with simple homemade cutting and hole punching equipment powered with a 1/4 HP motor. Illustrated instructions, 50c.
Profitable Toy Making. From scrap wood, paper, metal, rubber, linoleum, cloth, plaster, etc., 25c.
Liquid Rubber from Old Tires. Make molds, door mats and rubber articles. Ten formulas and processes, 50c.
How to Make 30 Useful Articles of Wire and Sheet Metal with homemade jigs. Illustrated, 50c.
Rubber Mold Making. Marbleizing, glazing, etc., 25c.
Security in a Small Farm. Twenty ways describes, 25c.
10 Local Business Plans net up to \$200 a month, 25c.
Collection of 100 Selected Formulas. 25c.

All 8 of the Above List of Booklets and Formulas, \$2.00. No C.O.D.

New Ways Cut Building

cost of houses, garages, poultry and farm buildings, cabins and stores. Make wall-high, insulated blocks with inside and outside finish with simple, home-made equipment. Composition roofs and floors. Ten formulas. Cement panels and tiles. Stream-lined roof, walls and gutters. Several ways to use cheap wood with cement makes strong buildings. Wall-board of sawdust. Save hundreds of dollars. 100 money and labor saving ideas. Mixer and buzz saw easily made from an old auto. 40 proved ways to earn \$10.00 to \$15.00 a day. Guaranteed illustrated booklets, \$1.00.

MAKE FURNITURE OF COMPOSITION cement, sawdust, paper, asbestos, home-made cement. Some part scrap wood, and metal make tables, cabinets, chests, racks, shelves, inclosed sinks, lawn novelties and toys. Over 500% profit, 50c.

HOW TO MAKE ACCURATE WOODWORKING MACHINES. saws, drills, lathes, tools, electric weed cutters and many other things from old auto parts and washing machine motors. Illustrated, 50c.

HOME MFG. ENTERPRISES. 50 selected home shop projects, 50c. Special: All five booklets described above, \$2.00 postpaid. No C.O.D.

HOME INDUSTRIES, 1318 So. 30th Ave., Dept. PS., Omaha 5, Nebr.

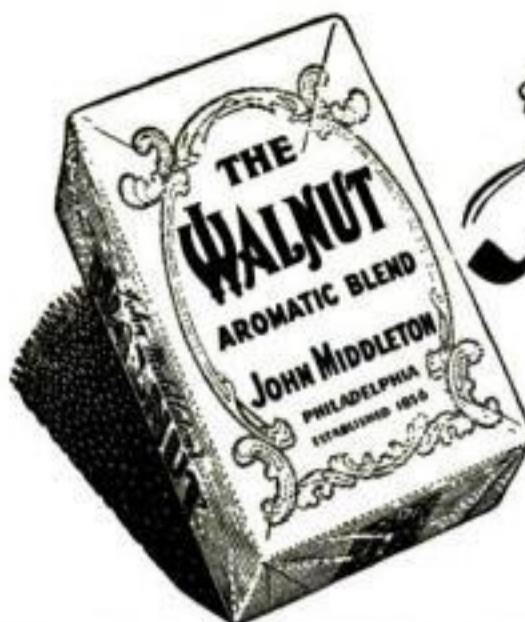
Enclosed find \$..... for which mail booklets as checked.

NAME.....

ADDRESS.....

CITY..... STATE.....

**Pipe-Tobacco
at its best**



*30c the
pocket-
packet*

With that RICH, NATURAL, NUTTY Flavor

Write for free booklet, "The Choice of Experience." John Middleton, 1203 Walnut Tobacco St., Phila. 7, Pa.

Custom-made for the Carriage-trade since 1856

NEW CHEAP OIL BURNER

FOR COOKING & HEATING STOVES-FURNACES
**HEAT YOUR HOME, COOK YOUR MEALS
WITH CHEAP FURNACE OIL**

NO MORE SHOVELING COAL OR ASHES. New Fuelizer Starter Vaporizing System turns Cheap 130 Flash Furnace Oil into Oil Gas heat without clogging up. LIFE-TIME GUARANTEE against defects. \$1.00-BONUS OFFER FOR TESTING. We will let you try it in your own stove or furnace for one month. Get Yours for introducing. Big profits.

Be first. Send in your name today.
NORTHWEST MFG. CO., 562-A 5th Ave., Mitchell, So. Dak.

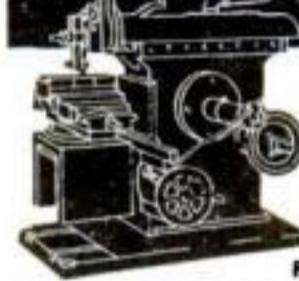
Be popular with MAGIC..

ENTERTAIN WITH MAGIC FOR FUN OR PROFIT. We carry a complete line of professional as well as amateur magic. SEND 25c AND WE WILL SEND YOU OUR NEW 84 PAGE ILLUSTRATED CATALOG . . . ALSO A 50c TRICK FREE, TO GET YOU STARTED.

THE MYSTERY MART, Dept. P.S. 1, 737 N. Jackson St., Milwaukee 2, Wis.

BUILD YOUR OWN MACHINE TOOLS!

Blueprints \$1.00 - Catalog FREE



Detail construction Blueprints on 6 Lewis metal and wood-working tools postpaid for \$1.00. Includes prints for Lewis 10" Shaper, Milling Machine, Drill Press, Vise, 16" Band Saw, 6" Jointer. Plain or semi-finished castings available for these tools save up to 80% of comparable new tool cost.

Illustrated 32-page Catalog—sent free with Blueprint Order—describes 20 Lewis tools. WRITE TODAY!

LEWIS MACHINE TOOL CO.
P.O. Box 116, Sta. A, DEPT. D-26, LOS ANGELES 31, CALIFORNIA



DRILL-INDEX

A compact container for indexing and filing twist drills. Eliminates search. Made entirely of steel in nine sizes. See your dealer or write to

HUOT MFG. CO.

St. Paul 1, Minn.

New Designs in

FRANZITE GRIPS

Modernize Your Gun! Improve Your Score!

Most durable grips made. Positively unbreakable! For Colt, Smith & Wesson, Hi-Standard, Ortgies, Luger & Mausers in a wide choice of beautiful designs in ivory, pearl, walnut, onyx, etc. Low prices. FREE CATALOG. Dealers Wanted.

SPORTS, INC., (Mfrs.) 5501 Broadway, Dept. S-1, Chicago 40, Ill.

POPULAR SCIENCE

NEW BIG MONEY FIELD!

Make ANY Article

GLOW IN THE DARK

with Magic New Discovery!

\$1.00

MODEL AIRPLANES
LIGHT SWITCH
FLOWERS
JEWELRY
PULL CORDS
CLOCKS
COSTUMES
FURNITURE
FUSE BOX
KNOBS & KEYHOLES
TELEPHONE
SIGNS
STATUES

Undreamed of profits RIGHT NOW
in this wonderful new business.

One man sold over 200,000 glowing Statues of Christ for \$1.00 each. Another sold 25,000 glowing Crucifixes for \$1.00 each. Others have sold hundreds of thousands of glowing jewelry, glowing flowers, glowing pictures—**at BIG PRICES and BIG PROFITS!** This new Glow-in-the-Dark craze is sweeping the country. We show you how to get in this profitable business **QUICKLY** at a cost of only \$1.00! We show you how to take advantage of today's unequalled money-making opportunities. But you'll have to act FAST. Our supply is limited.

HUNDREDS OF USES

make unlimited number of glow-in-the-dark articles. Here are a few: Model airplanes, orchids, gardenias, service flags, earrings, flowers, neckties, switches, religious statues, house numbers, furniture, pictures, clocks, stairs, holiday ornaments etc. In addition, for safety purposes you can "light" medicine cabinets, knobs on radios, medicine bottles, doors, furniture, dark corners, etc. You can also originate "glowing" greeting cards, photographs, games, stationery, etc. Many wonderful uses. We give you hundreds of suggested money-making uses.

SEND NO MONEY! For quick delivery send coupon or penny postcard. Then pay postman \$1.00. \$2.00 or \$5.00 plus postage and handling charges. If you send cash with order, WE pay all postage and handling. But be sure to order NOW! Supply limited.

LITE-GLO COMPANY, Dept. 116LA, Topeka, Kan.

FREE!

With your order for our largest Kit—Go-Into-Business-Size for only \$5.00—we include **FIVE** attractive composition religious figures which, when made to **Glow-in-the-dark** should retail for \$5.00—or the cost of the kit!

THREE DIFFERENT SIZE KITS!

Take your choice! Money-back guarantee on ALL kits! (1). Complete introductory size kit. (2). Senior Kit. \$2.00. This kit contains three times as much material as the \$1.00 Kit. Also two colors, blue and purple. (3). Go-into-business Kit. \$5.00. This contains FOUR times as much material as \$2.00 Kit, also two colors. In addition, on this limited offer, you get **FIVE** composition religious figures FREE with \$5.00 Kit!

CLIP AND MAIL COUPON NOW!

LITE-GLO CO., Dept. 116LA, TOPEKA, KANS.

Please send me Lite-Glo Kits as marked below. With \$5.00 order be sure to send the Five FREE composition religious figures.

\$1.00 Kit \$2.00 Kit \$5.00 Kit

I am enclosing \$..... Send C. O. D.

Name

Address

City State

The Taller Fellow has the Advantages in Life

DID YOU KNOW that while the average height of their forbears in Japan was only 5 feet 2 inches "a cross section of Hawaii's American-Japanese community provided a better type of soldier than Japan was getting and that **MANY WERE ALMOST SIX FEET TALL**?"—(Vide "New York Times," April 4, 1943: Report of a statement by General Emmons, Commander, Hawaiian Dept., U. S. Army.) Read ...

BUILDING HUMAN STATURE (A Complete Study) to learn why and to what scientists attribute the increased height of these men with hereditary small stature. Read what, according to authorities, made them and others GROW SO MUCH TALLER than their forefathers. This book, compiled by a Doctor of Science who was once a famous champion athlete and editor, is well written in non-technical language, and contains the research results, the opinions, and the ADVICE of the world's greatest authorities, physiologists, physicians, anthropologists, biologists, and physical culture experts, on this most significant matter of increasing human height. What made the average New Zealander **FIVE-AND-A-HALF INCHES TALLER** than the Indian? This book, "**BUILDING HUMAN STATURE**—A Complete Study," tells you. It is a . . .



FATHER AND SON

Son exceeds father's height by nearly a head. This young man grew almost 6 inches during a year that he used a Suspension Apparatus.

ous photos, sketches and diagrams:—Foreword, by Capt. Juan Cano—Huge Funds Subscribed for Stature Building Research—Age Limits—Ideal Womanhood Considerably Taller Than Formerly—Barnard College Head Expects Height Record for Students—Are Tall Men Strong and Brainy?—The Truth About Heredity in Height Increase, Not a Completely Contrary Factor—Height a Variable Factor—Hereditary Complications—Food for Stature Building—What Sir John Orr Advises—Tryptophane Essential to Full Growth—Vitamins for Stature Building—A "New Growth Spur" Found in Vitamin—Dr. Ehrmann's Basic Nutrition—U.S. Surgeon General's Dietary Advice—How Food Has Affected Stature the World Over—Bone Development—"Response of Bones to Stimuli"—Natural and Artificial Bone Growth—How the Ductless Glands Affect Stature—"Gains in Height Varying From 1 1/2 to 6 Inches From Gland Treatment—Tracking Down the Growth Principle—Some Very Tall Human Specimens—A Famous Dwarf Doubled His Height at 39—Building the Japanese Stature—How Some Japanese Have Developed Almost 6 Feet Stature—Increasing Stature in the Soviet Union—How Russian-Jewish Children in U. S. Grew 5 Inches Taller Than Their Parents—Height Disparity in Children—Various Authorities on Stature Building—What Professor Delehanty Outlined as Factors Which Increase Height—Dr. Fishbein, Head of American Medical Association, Advised Exercise for Metabolism and Stimulation of Growth—Ad-

vice of U.S. Director of Physical Fitness—Dr. Greulich, of Yale, Using X-Rays, Praises Height Increasing Benefits—Stature Gaining Factors According to Dr. Krogman, Noted Anthropologist—Dr. George Crile's Physics of Growth—8 Ft. Watusi and 3 Ft. Bushmen in Africa: Why?—Some Suggestions For An Exercise System—Suggested Free Exercises—Exercises With Two Chairs—Advanced Chair Exercises—Exercises on Homemade Trapeze and Rings—Specialized Use of Weights for Pronounced Stretching—Increased His Height 6 Inches in 16 Months—Body Suspension—Clear Simple Instructions for Making Suspension Apparatus—Use of Suspension Apparatus—High Pay Jobs as Instructors.

You will find this book fascinating to read. It is interspersed with reminiscences of the writer, many amusing, all informative. Thrilling stories of giants and dwarfs. Well printed and illustrated. Send NOW for this valuable book. Enclose check, money order or cash for \$3.75 and copy will be delivered postpaid in plain wrapper. Your money will be refunded if you are not entirely satisfied.

Cut out and mail this coupon to **CARILLON BOOKS**, Dept. 10, Boerne, Texas. DO IT NOW.

In business a commanding presence is advantageous in almost any department of making a living.

MOST IMPORTANT AND AMAZING BOOK The average person grows, or has the possibility of growing, until he or she is between 21 and 24 years of age. Bob Hoffman, editor of "Strength & Health," wrote: "Some people have recorded an increase in height after reaching their thirties." Gerling, whose book "Short Stature and Height Increase," has been acclaimed by numerous medical journals, wrote: "Even after the period of growth is past (after about 21-24 years of age), though the response to growth stimulating factors will no longer be as great, it is still possible to secure gratifying results." The writer of the book, "**BUILDING HUMAN STATURE**—A Complete Study," urges that what are considered to be height-stimulating factors should be adopted at the earliest possible age in order to expect the best results.

Captain Juan Cano, Commander of the Health Service, Spanish Loyalist Army Volunteer Divisions, writes: "There is no doubt in my mind that if a young man inclined towards shortness of stature apply himself to the recommendations in this book it should make considerable difference in his ultimate height and figure." If you are in the growing age you have a particular interest in getting a copy of "**BUILDING HUMAN STATURE**—A Complete Study." Get it NOW and read every word. It has FULL AND EASILY FOLLOWED DESCRIPTIONS AND DIRECTIONS FOR MAKING THE STRETCHING AND SUSPENSION APPARATUS.

Every parent who wishes his children to achieve fine stature should have this book. **READ THIS PARTIAL LIST OF CONTENTS** of 22 chapters, over 300 pages and numer-

What thug would attack a big man?

CARILLON BOOKS,
Dept. 10, Boerne, Texas.
Please send at once "**BUILDING HUMAN STATURE**—A Complete Study." I enclose \$3.75.

Name Address

*Quick! Permanent!
Sticks to all surfaces!*

CASCO FLEXIBLE CEMENT

the best news to homecrafters in years!



Just look at what this new product does!

1. Bonds a wide variety of materials, such as:

WOOD
WALLBOARD
PLASTER
FABRIC
LEATHER
FELT
CANVAS
PAPER

METAL
PLASTICS
GLASS
ENAMEL
FOIL
LINOLEUM
SHEET RUBBER
ETC.

2. Can't Crack Loose: Casco keeps joints flexible—absorbs shocks and expansions.

3. Resists Moisture: Makes heat- and moisture-resisting joints in bathrooms, kitchens, etc.

4. Convenient to use: Does not stain or discolor surfaces. It's white! Non-inflammable, too! No heating necessary. Easy to work with.

Get a large (2-oz.) 25¢ tube at local hardware, paint, or building supply dealer's.

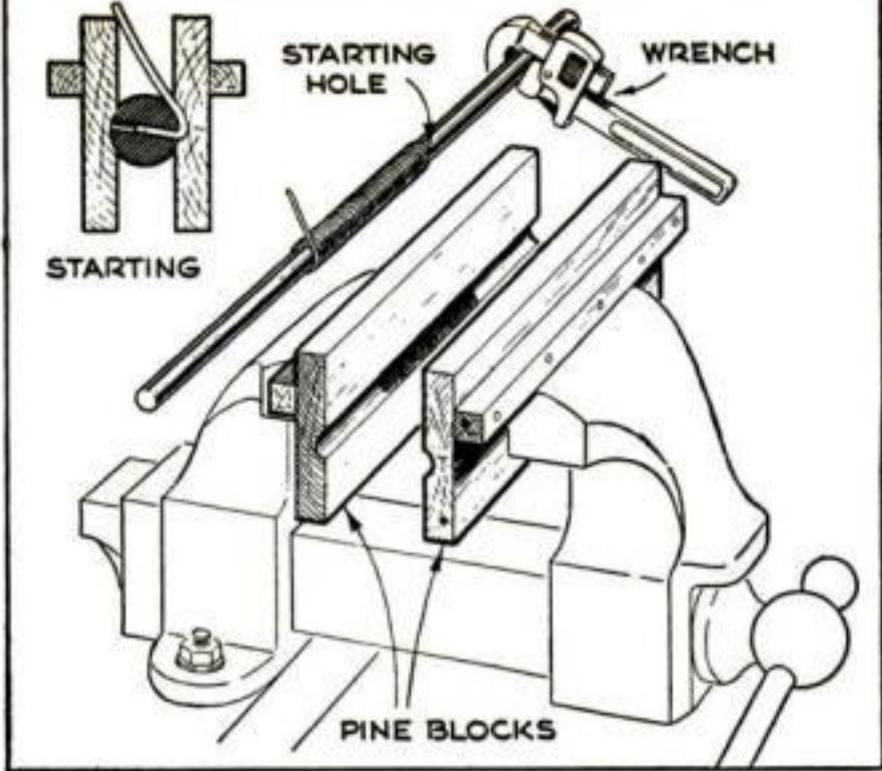
CASCO FLEXIBLE CEMENT

Also 1/2-pint, pint, quart, and gallon sizes.



CASEIN COMPANY OF AMERICA
(Division of The Borden Co.)

Dept. PS-25, 350 Madison Avenue
New York 17, N. Y.



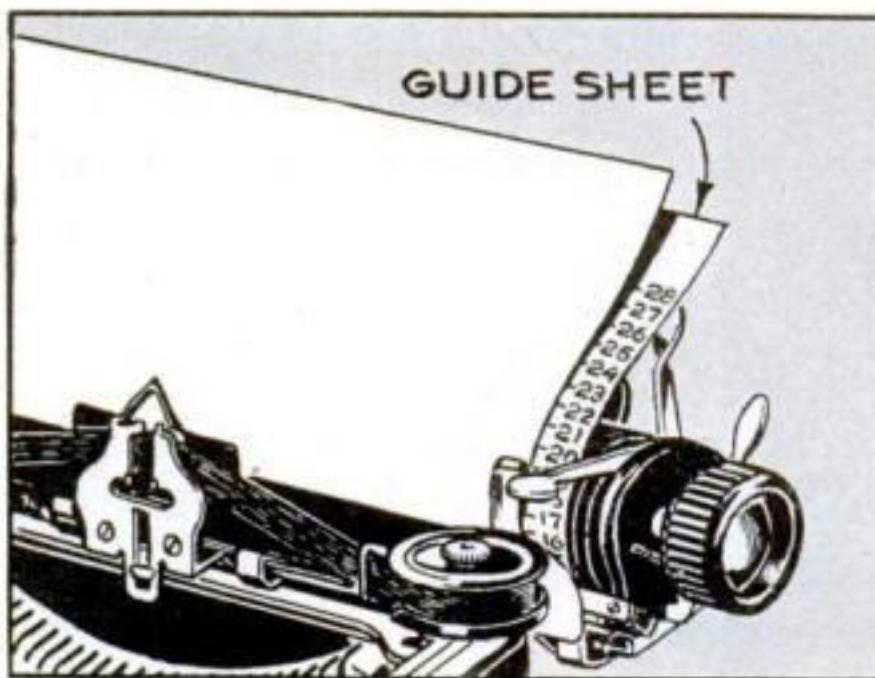
Winding Springs Without a Lathe

HOME craftsmen who have found it difficult to obtain springs of the right materials or dimensions can wind their own even without a lathe.

Procure a rod slightly smaller than the desired diameter and drill a starting hole near one end. Pass an end of the spring wire through this hole and clamp the rod between two blocks of soft wood mounted in a vise as shown. As the rod is turned with a wrench, the wire will coil itself and cut a thread in the soft wood. Make allowances for a slight uncoiling of the spring after it is removed from the clamp.—P. W.

Guide Sheet Evens Typing Margins

EVERY typist has had the experience of spoiling the appearance of a page by overrunning the lower margin. A backing sheet, numbered to show how many lines remain, can end this nuisance. Mark off the spaces in the margin and insert with the paper so that the marked portion extends about $\frac{1}{4}$ " along one side. A glance will show how many lines remain at any time.—FRANK SHORE.





A SNAP TO START
"O.K."
SUPER '60'
ENGINE
FOR
MODEL AIRPLANES
FOR
FREE FLIGHT
OR
CONTROL-LINE

DESIGN FEATURES

CYLINDER—1 piece
CRANKCASE—
aluminum-alloy
PISTON—machined
from steel, hardened
and lapped
to cylinder
BALL-BEARING—
Radial and thrust
BORE .900, STROKE
.950, DISPL. .604,
WGT. 12 ozs.

"OK" Super "60" is palm-size power plant! Gives consistent flying power to model airplanes! A snap to start! Many exclusive design features including PATENTED PORTING for complete, instantaneous scavenging. TOP SPEED (to 9000 RPM) Super "60" with coil, spark plug, gas tank, condenser \$24.00 at all model hobby shops.

FREE! Descriptive Brochure and Installation diagram.
(Send stamped and addressed envelope)

HERKIMER TOOL & MODEL WORKS
HERKIMER (Dept. PS) NEW YORK

BUILD DUTCH WINDMILLS

Lighthouses, lawn figures, lawn chairs, trellises, etc., beautify your garden

Model B-30 Windmill 24" high.
Wings operate fan at buck saw. Blueprint... 50c
Model B-10 Windmill hexagon style, 40" high
overall. A beautiful model. Blueprint... 75c
Model H-10 Lighthouse, 40" high. Blueprint... 75c

Comfortable, sturdy Cape Cod lawn chair.
Blueprint... 50c

12 Artistic Trellises. Blueprint all 12
only... 50c

Special All Blueprints mentioned above for only \$2.00

"Over 35,000 Satisfied Customers"

Send 10c for Illustrated Catalog.

CRAFTSMAN'S MODEL CO., 2030 N. 41st St., Dept. K-1, Milwaukee, Wis.



GEARS

In Stock—Immediate Delivery

Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blueprints and inquiries.

Send for Complete Catalog No. 220
CHICAGO GEAR WORKS
440-48 N. Oakley Blvd. Chicago 12, Ill.



NEW TINY POCKET SIZE RADIO!

Slips in your pocket or purse—Wt. only 3 ozs! Complete READY TO PLAY as shown with self contained phone for personal use. Beautiful black silver plastic case. Has patented fixed Crystal-Slide Tuning Dial! NO TUBES, BATTERIES OR ELECTRIC PLUG IN REQUIRED, USUALLY RECEIVES LOCAL BROADCASTS without outside aerial wires.

GUARANTEED TO WORK

When connected and used according to instructions or your money back. 10 day trial. Can be used in homes, offices, hotels, cabins, in bed after hours, etc.

Send Only \$1.00 (cash, money order, check) and pay postman \$2.99 plus delivery fees on arrival or send \$3.99 for postpaid delivery. IDEAL GIFT FOR CHILDREN OR ADULTS ALIKE! Get your PA-KETTE RADIO NOW for real enjoyment. Dealers in most cities.

PA-KETTE ELECTRIC CO.

Dept. PS-2

Kearney, Nebraska

"I'VE WORN
Carhartt
OVERALLS

FOR OVER 50 YEARS"



• Carhartt work clothes guarantee the easy fit, comfort and fine wearing qualities that only come with years of experience in building better overalls. Railroad men, the country over, have worn Carhartt's for more than 50 years—a great tribute to the wear and fit of Carhartt Master Cloth Overalls.

Better tailoring and workmanship, experienced design, stronger reinforcing and stouter lock-stitching make Carhartt's America's outstanding work garment value. Count on Carhartt to give you the best that money can buy—backed by a 50 year money back guarantee.



Carhartt washable work caps are skillfully tailored, full cut for lasting wear, are neat in appearance, insure comfort fit.

On sale at your local dealers.

HAMILTON CARHARTT OVERALL COMPANY

Detroit, Mich.

Atlanta, Ga.

Carhartt Park, Ky.

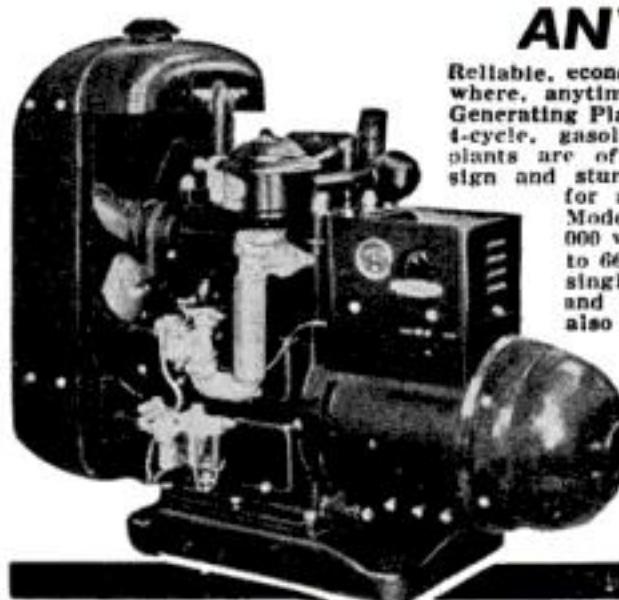
Dallas, Texas



Carhartt
FOR OVER 50 YEARS A FRIEND TO ORGANIZED LABOR

ELECTRICITY FOR ANY JOB

ANYWHERE



Reliable, economical electric service anywhere, anytime, with an Onan Electric Generating Plant. Driven by Onan built, 4-cycle, gasoline engines, these power plants are of single-unit, compact design and sturdy construction. Suitable for all types of service. Models range from 350 to 35,000 watts, A.C. types from 115 to 660 volts; 50, 60, 180 cycles, single or three-phase; 400, 500 and 800 cycle, single phase; also special frequencies. D.C. types range from 6 to 4000 volts. Dual voltage types available. Write for engineering assistance or literature.

ONAN

Your OWN Business!



APECO
"America's Most
Widely Used
Photocopy
Equipment"

As little as \$100 Starts You NOW!

No Training Needed

Make good money by making photo-exact copies of important papers, letters, drawings, photos, veterans' discharges, etc.—for local firms, lawyers, real estate men, accountants, advertising men, engineers, architects, others. Every business is your prospect for error-proof, low-cost photocopies.

New, amazingly simple

method requires no lens, darkroom, or training! A table-top with only \$100 worth of APECO equipment puts you in business for yourself! Easy to start... many prospects... quick results... pleasant work—here's a combination that's a real money-making opportunity—good for a lifetime!

Get Full Information! MAIL COUPON NOW!

AMERICAN PHOTOCOPY EQUIPMENT CO.

2849 N. Clark St., Dept. HU16,
Chicago 14, Ill.

Please send me your illustrated book and details about the APECO business opportunity.

NAME.....

STREET.....

CITY..... STATE.....

**GET BIG PROFITS from
SMALL INVESTMENT**

OTTAWA

6 H-P LOG SAW



**Log Saw of the
Future TODAY!**

**FELLS TREES...
SAWS LOGS Fast, Easy**

**Buzzes
Up
Small
Limbs**

Demand for wood increases! Prices are higher than ever before. You can make real money sawing wood, if you have an Ottawa. Equipped with an easy to start, air-cooled 6 H-P engine. Designed for easy handling. Complete one-man machine with safety Saw Guide and other exclusive Ottawa features for fast sawing.

USE FOR OTHER JOBS—when not sawing wood, use engine for any belt job. Thousands in use. FREE BOOK and price list. Write today.

OTTAWA MFG. CO., 101 Pine Street, Ottawa, Kans.

"JACKPOT"

Home Model COIN MACHINE

Get this new, colorful payout machine for your recreation room! Soon pays for itself! Three fruit reels. Costs player 5c per play. Pays off one quarter automatically on two cherries etc. (Retains 60% for house; 40% winnings for player). Also can be operated to pay off tokens, 25c size, bearing odds from 3 to 1 up to 100 to 1. Complete with 121 metal tokens. Size 10 x 10 x 10 in. Metal construction. Wt. 16 lbs. Send \$10.00 deposit, balance C.O.D., F.O.B. Chicago. Immediate delivery... Each **\$49.50**



Webb DISTRIBUTING CO.

612 NORTH MICHIGAN AVENUE • CHICAGO 11, ILLINOIS

**FREE!
FAMOUS
BLUE BOOK
CATALOG**

GAME SUPPLIES

Club Furniture - Counter Games - Punchboards - Magic Cards Readers, Read the backs - Inks - Daubs - Poker Chips - Tops Flats - Layouts - Game Boxes.



K. C. CARD CO. Dept. 1223, W. Washington Blvd., Chicago 7, Ill.



FEET HURT?

Try Dr. Barron's
New Foot Cushion

Many with tired, aching feet have found happy relief! So comfortable—LIKE WALKING ON A PILLOW! Made of fine soft, spongy material, leather covered. So light, flexible—cushions and helps relieve your feet from heel to toes. If you suffer from metatarsal callouses, corns, foot pains or fallen arches, try Dr. Barron's Foot Cushion. Wear in any shoes—helps make walking a pleasure. Doctor says: "I recommend Foot Cushions to foot sufferers." Send only \$1.98 for A PAIR—or will ship C. O. D., plus postage. **STATE SHOE SIZE AND IF MAN OR WOMAN, 30 DAY TRIAL GUARANTEE.** Money back if you don't get blessed relief! ORTHO COMPANY, 111 West 83rd St., Dept. 48-A, New York City 24.

CODE SPEED

SHORT CUT

Be an expert. Learn to be a Telegrapher or Radio Operator. Thousands of men needed. Intensely interesting work—good pay. Learn at home or wherever you are, quickly, easily with the famous Candler Speed System. Book of particulars Free. **CANDLER SYSTEM CO., Dept. 6A, Box 928, Denver 1, Colo. U.S.A.**

JET PROPULSION

Experimenters! New principle to drive boats, bicycles, model helicopters. Circular on plans. Rush name. Houston Maupin, Tipp City 13, Ohio.

THE HOUR HAS STRUCK!

This is the end of an age. A new civilization and order is at hand. Learn the astounding facts of 76,000 years of human history. Find out what has happened—what still lies ahead. Be prepared. 20c in stamps or coin can change your life. Send for LEMURIA THE INCOMPARABLE, illustrated, informative booklet on the New Order, 25,000th printing. Write today.

Be a Citizen of the New World

LEMURIAN FELLOWSHIP—Dept. Q
118 North Larchmont Blvd., Los Angeles 4, California

**EXTRA MONEY
FOR YOU WITH
LEAF WORK AND SPORT GARMENTS!**

Act as Local Dealer for LEAF UNION MADE WORK GARMENTS AND SPORTSWEAR. Pleasant work. Experience unnecessary. Great demand daily from millions of workers. We supply everything required. Write at once for FREE Outfit.

LEAF GARMENT CO.
1213-19 VanBuren St., Dept. 100, Chicago, Ill.



POPULAR SCIENCE

Copyrighted material

GET THE SET—SAVE 15%

Complete Set of 4
Clark Lever-Lock
BORING BARS
 Packed in Sturdy Wood Box
 4 precision boring bars, 3/16", 1/4", 3/8", 1/2" hardened drill rod... each with the exclusive Clark Lever-Lock that grips tool bit at extreme end to bore or thread to bottom of blind hole with full clearance; 4 precision ground thread tool bits and 4 boring bits tempered by deep freeze process. Extra round bits available, ground or unground. MONEY BACK GUARANTEE. Order today! Dept. PS-1-LLB

Immediate Delivery
\$870

Robert H. Clark Company

9330 SANTA MONICA BOULEVARD • BEVERLY HILLS, CALIFORNIA

MADE FROM IMPORTED BRIAR



Enjoy unmatched sweet smoking quality, outstanding fine grains, in modern designs, \$3.50 to \$10. At leading tobacconists everywhere.

Write for FREE illustrated booklet.
 C. B. WEBER & CO., 146 Cator Ave., Jersey City 5, N. J.

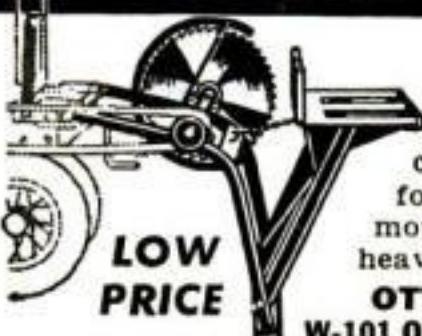


MAGIC CUTTER

Cuts up to 4" hole in plastics, wood and metal. Wonder tool for amateurs and professionals developed by famous lab for own use. Send \$1 to: Dept. A-12 ROBERTS ASSOCIATES P. O. Box 622, G. C. Annex, N. Y. 17

\$1

New OTTAWA WOOD SAW



For Tractors

Makes wood sawing fast and easy. Can cut enough wood to pay for itself quickly. Easily moved while attached. Big heavy blade. FREE details.

OTTAWA MFG. CO.
 W-101 Oak Ave., Ottawa, Kans.

**THE MOST DELICATE JOB
 OR REPAIR
 HEAVY FURNITURE**

with genuine hide glue, ready to use, no mixing, no heating when you use

FRANKLIN
Liquid Hide GLUE

30¢ AT YOUR
 HARDWARE
 DEALER



THE FRANKLIN GLUE CO., COLUMBUS 15, OHIO

JANUARY, 1946

Great Moments of THE WAR!

—by GRAFLEX



Get your FREE copy Now!

THE WAR'S BEST PICTURES! Startling action photos "shot" by front-line cameramen from the Army, Navy, Coast Guard and Marine Corps—plus the exciting story of photography at war! Ask your local GRAFLEX Dealer for a FREE copy, or send 10¢, to cover handling, to GRAFLEX, Inc., Dept. PS1, Rochester 8, N. Y.



GRAFLEX

(Formerly THE FOLMER GRAFLEX CORPORATION)

**Now
 for EVERY WORK SHOP!**

**NEW
 Invention** **Electroplates
 by BRUSH**



**Easy to Plate CHROMIUM
 GOLD, SILVER, NICKEL, COPPER
 . . . For Pleasure and Profit!**

If you have a workshop—at home or in business—you need this new Warner Electroplater. At the stroke of an electrified brush, you can electroplate models and projects—you can replate worn articles, faucets, tools, fixtures, silverware, etc. with a durable, sparkling coat of metal . . . Gold, Silver, Chromium, Nickel, Copper or Cadmium. Method is easy, simple, quick. Everything furnished—equipment complete, ready for use. By doing a bit of work for others, your machine can pay for itself within a week. So make your shop complete by getting a Warner Electroplater right away. Send today for FREE SAMPLE and illustrated literature. ACT AT ONCE! Mail Coupon. **WARNER ELECTRIC CO., DEPT. G-10**
 663 N. Wells St., Chicago 10, Illinois

FREE Details & Sample!

WARNER ELECTRIC CO., 663 N. Wells St. Chicago 10, Dept G-10
 Gentlemen: Send Free Sample and Details to:

Name _____

Address _____

City _____ State _____



HANDEE

TOOL OF
1001 USES

The first small portable tool and today's finest. Smooth, steady power at your fingertips. You'll be amazed at what you can do with your Handee—turn out professional looking projects for pleasure or profit—ship, plane or train models, costume jewelry, wood carvings, puppets, initialed tumblers, etc. Uses 300 different accessories. AC or DC. 25,000 r.p.m. Weight 12 ounces. With 7 accessories, postpaid \$18.50.

MAKE THINGS FROM
WOOD • PLASTICS
METALS • GLASS
LINOLEUM
LEATHER • ALLOYS
HORN • STONE
BONE, etc.



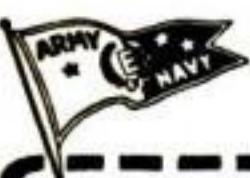
GET A GOOD
START GET THE
HANDEE KIT

HANDEE Tool and
45 most popular ac-
cessories, in handsome,
compact, steel carrying case!

Set includes steel cutter, drills, bristle
brushes, polishing wheels and points, rubber
disc, drum sander and bands, mounted
wheels, Speed Oil, sandpaper discs. You'll
be amazed at what you can accomplish!
Complete, postpaid....

\$25.00

FOR YOURSELF OR A FRIEND...
THE GIFT OF A LIFETIME!



ORDER NOW!
Use This Coupon!

FREE
64-PAGE
Catalog

CHICAGO WHEEL & MFG. CO.
1101 W. MONROE ST. DEPT PO
CHICAGO 7, ILL.

Send me HANDEE TOOL HANDEE KIT REMIT-
TANCE ENCLOSED SEND C.O.D. SEND CATALOG.

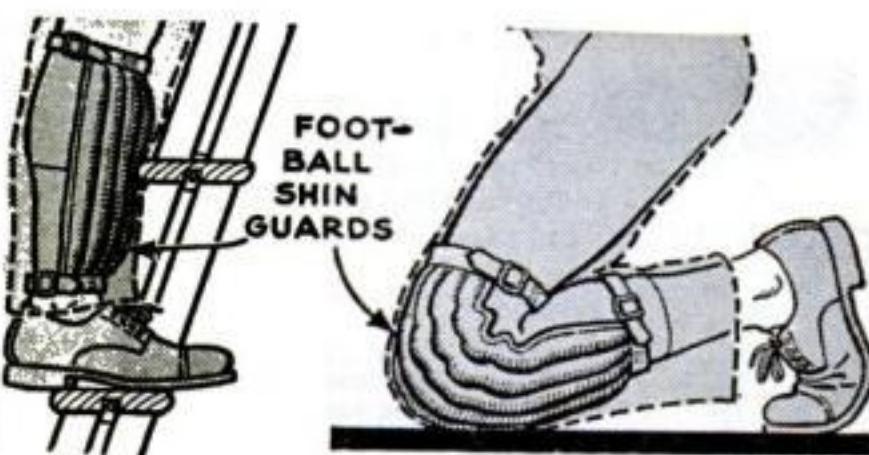
Name.....

Address.....



SORTING TRAY USEFUL IN SHOP

FORMED from sheet metal, this tray saves much time in sorting small parts. Any piece can be quickly shoved off with the finger and dropped into a drawer. The tray also is a handy place to dump a drawerful of unsorted parts when one must be selected, for all can be returned easily.—R. V. S.



SHIN GUARD PROTECTS WORKMAN

FOOTBALL shin guards are just the thing to prevent bruises on the legs while working on a ladder. Knee pads also can be used as protection in kneeling jobs. Similar guards might be made from canvas and a thick padding material.—A. B. WEGENER.

MORTISE AND TENON



Pli-renc SUPER POWER, LOCKING

IT'S ALL
IN THE
RED JAW

SELF ALIGNING

LOCKS WORK WITH TONS OF
PRESSURE . . . HANDS FREE

This remarkable brand-new tool is a combination pliers, wrench, pipe wrench, clamp and hand vise. The self-aligning jaw fits itself to irregular shaped objects, giving a powerful, jaw-length grip, multiplying hand pressure at least fifty times. A whale of a tool! OPA ceiling price \$2.45. If your dealer cannot supply you, order direct.

THE WHALE TOOL CORP.
1767 BROADWAY, NEW YORK 20, N. Y.



ALL FIVE . . .

WONDER-SHAVE has all five, not just 3 or 4, but all five of the essentials for clean, comfortable shaves.

- A whisker-softening agent to "blitz" your whiskers.
 - Skin-protective oils to safeguard your face.
 - A non-greasy, non-sticky texture—no clogged razors.
 - Cooling, refreshing ingredients for your comfort.
 - Not highly perfumed—a gentle pine-woods fragrance.
- IT'S NEW—IT'S DIFFERENT—YOU'LL LIKE IT—

Wonder-Shave BRUSHLESS SHAVING AT IT'S BEST

A two weeks trial will convince you WONDER-SHAVE is the best you ever tried. Send 15¢ today for generous size trial jar.

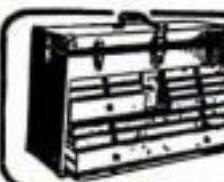
ROYAL-JAY PRODUCTS Box 337 Mamaroneck, N. Y.

MACHINE SHOP EQUIPMENT

Every man who owns a workshop should have a copy of this new, authentic catalog of Machine Shop Equipment . . . the latest tools made by the biggest manufacturers in the United States. Replete with illustrations, descriptions, prices. Prompt delivery on most tools listed in this catalog. Available at the cost of printing—50¢ a copy—Get yours today! Price of Catalog Refunded on First Order over \$5.00. Send check or Money Order to

CENTER TOOL CO.

152 Centre St., New York 13, N. Y.



PERFECTION

Genuine Gerstner Tool Chests are perfectly designed, perfectly made. Free catalog for Machinists and Toolmakers.

GERSTNER TOOL CHESTS
546 Columbia St., Dayton 7, Ohio

NEW! DIFFERENT! THRILL YOUR FRIENDS WITH **LIQUID LIGHT** Trade Mark CHEMISTRY BRINGS YOU

100 AMAZING EXPERIMENTS, TRICKS AND GAMES! All colors of the rainbow! Write with fire. Form whirlpools of light. Make "Neon Tubes" of light. And 97 others—with fluids that glow in the dark. 12 items in each LIQUID LIGHT KIT.

SEND NO MONEY! Pay postman \$2.98 plus postage. Or send cash and we pay postage. MONEY BACK IF NOT SATISFIED! FREE 45-page Booklet—"100 Experiments, Tricks and Games" with each Kit.

MAIL NOW → Pelham Scientific Projects, Dept. A-1, 1 Wolf's Lane, Pelham 65, N.Y.
Send me . . . LIQUID LIGHT KITS. () I enclose \$2.98 for each kit. () I will pay on delivery.

Name Street City State

JANUARY, 1946

Hear Better!



THIS ONE UNIT
IS ALL YOU WEAR
(with earpiece
and cord)

Beltone MONO-PAC

No separate battery pack!

No battery wire!

About $\frac{1}{2}$ the weight
of most hearing aids!

New freedom, new comfort, and clear, rich hearing! That's what the compact little Beltone MONO-PAC offers you. It's a masterpiece of electronic research and precision construction . . . with batteries and transmitter combined into a single streamlined case so small that it fits in the palm of your hand. Thousands wear it . . . try it and compare it!

Write for free booklet.

Beltone Hearing Aid Co.

Dept. P.S.-1, 1450 W. 19th St., Chicago 8, Ill.



Paint it yourself! For real plastic beauty—use Plasti-Kote, easy to apply, one coat does the job. Styled to the tempo of modern streamlined transportation, Plasti-Kote dries in three hours—NO BRUSH MARKS. Ten beautiful time-and-weather tested colors. \$2.95 quart.



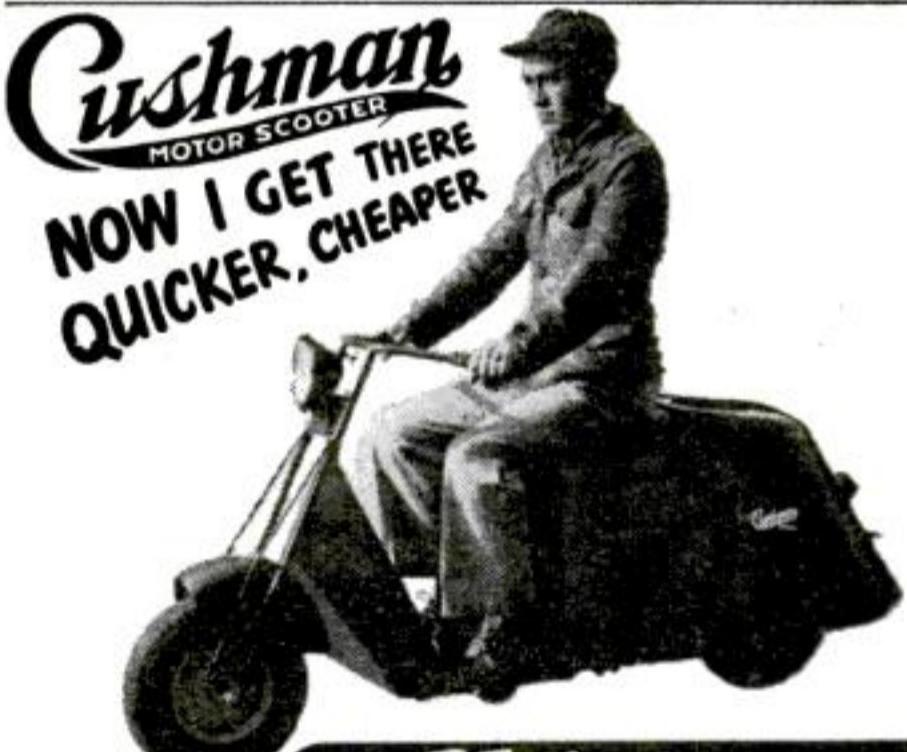
PLASTI-KOTE COMPANY

400 LAKESIDE AVE., N. W., CLEVELAND 13, OHIO

Send new color folder and descriptive literature:

Name

Address



IT'S A HONEY! . . . this new 1946 CUSHMAN—greatly improved by its years of rigorous war-time service! Now has surprising Speed, Comfort and Economy!

Thousands find it the ideal way to get to and from work, run errands, make light deliveries. Also available with side car or tandem seat to carry an extra passenger.

So much FASTER and EASIER than walking—up to 35 miles an hour! So much CHEAPER than using an auto—about 400 miles on \$1 worth of gas!

POWERFUL 4 H. P. ENGINE. Floating drive. Applies power as smoothly as Fluid Drive. New low and high gear gives power for steepest hills. Lower wheel base, improved spring action, big balloon tires, give new riding comfort. Durable electrically-welded all-steel frame.

OTHER MODELS: Paratrooper model for the sports rider. 3-wheel Package-Kar has front package-box that carries up to 300 lbs.—ideal for delivery service.

WRITE See your dealer who handles the CUSHMAN, or send for full details, photos and low prices on all 3 models. Send your name and address NOW!

CUSHMAN MOTOR WORKS, Dept. S-11, Lincoln, Nebr.

MAKE AND SELL FOR PROFIT Plastic JEWELRY AND NOVELTIES!

There's fun and profit in making plastic jewelry, novelties, and furnishings, in your home workshop! We have every material you need—Plexiglas, Lucite, Bakelite, Lignolite, Tenite II, Lumarith, in a large variety of sheets, rods, tubes, and special shapes. Also dyes, cements and other plastics supplies and accessories. Send 10 cents today for complete catalog. Address Dept. 1-A.

CARMEN-BRONSON CO.
165 EAST 3RD ST., MT. VERNON, N.Y.



The SUPER SYSTEM

of Natural Physical Training builds health and strength. Send for my free booklet "Building A Better Body". Also forward to me, postpaid, the courses checked below.
 Fundamentals Of Exercise & Strength Building 25c
 Body Conditioning And Midsection Course 25c
 Advanced Abdominal Course Of Progressive Exercise 25c
 Arm Developing Course (Weight Training) 25c
 Shoulder Developing Course (Weight Training) 25c
 All 5 courses only \$1.00. No stamps accepted.

GOOD BAR BELL CO., Dept. PS, Reading, Pa.

ONE-MAN SAWMILL LESS THAN

Easy To Turn Trees Into Money \$110⁰⁰

Makes Lumber
ties, shingles,
crates, lath,
studding,
siding.

BELSAW MODELS in
to 24 feet sawing
lengths. Patented Mechanical
Feed, accurate set works and posi-
tive dogs. Use tractor or old auto en-
gine for low cost power. Thousands used for
commercial sawing. Pays for itself quickly. Send
post card today for FREE booklet "How To Make
Lumber" and Catalog of Woodworking Equipment.

BELSAW MACHINERY COMPANY
Dept. 1846L 3542 Main Street, Kansas City 2, Mo.

Build
Low
Cost

TELESCOPES

Booklet
10
Cents

Booklet of ideas, plans, and materials for building inexpensive, tremendously powerful, telescopes. Hundreds of types and sizes possible. Complete, easy instructions so simple a boy can follow them. Plus list of outstanding optical values. Join the thousands who enjoy this fascinating hobby. Telescopes are NOT expensive to build. 10c brings booklet.

Beelerscope, Box 235PSA, No. Hollywood, Calif.

If Ruptured



Do What Others Now Do—
Wear a Form Fitting
MILLER Truss

which provides natural freedom and comfort in working, walking, playing, horse back riding, dancing, swimming or sleeping. You just cannot afford to be without this protection and convenience.

Wear two weeks then consult your physician before deciding to keep it.

Write me today for FREE descriptive circular. Sent in plain, sealed envelope.

FRED B. MILLER Manufacturer
Dept. P.S. Hagerstown, Maryland.

SIGNS EASILY AND EXPERTLY PAINTED WITH LETTER PATTERNS
AND SHOWCARDS MANY SIZES & STYLES WRITE FOR FOLDER JOHN F. RAHN
1330-33 N. CENTRAL AVE. CHICAGO 51, ILL.

**INTRODUCING-New Victory Model
HANDIWELD ELECTRIC
ARC WELDER**

FULLY
GUARANTEED

RETAILS
ONLY
\$1.95



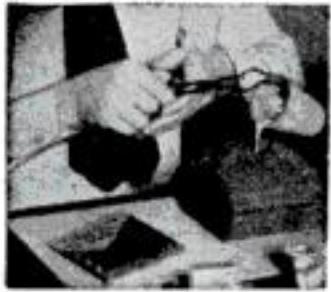
**PLUGS
into LIGHT SOCKET**

VICTORY Model Handiweld Arc Welder operates from 110 volts, A.C. or D.C. current same as other arc welders higher priced; generates tremendous heat to weld all metals. Not a toy welder that uses carbons, but actually uses standard coated rods — sizes $1/16"$ and $3/32"$. Generous quantity of $1/16"$ and $3/32"$ rods supplied with the welder. Guaranteed not to burn out. Repairs fenders, auto bodies, radiators, machinery parts, etc. Take Victory Model Handiweld anywhere to job, operate right from light socket. You'll find a thousand uses for this welder around your home, garage, workshop. Also in garages, factories, repair shops, tin shops; mechanics, inventors, plumbers, farmers, etc. Order a "VICTORY MODEL" HANDIWELD today!

SEND NO MONEY We'll rush one to you with rods, helmet, operating instructions, and all necessary parts with the exception of a large jar and small piece of extension cord; these most everyone has. Pay postman only \$1.95 plus few cents p'st'ge. If not delighted return Victory Model Handiweld in 5 days from receipt and money paid for it will be refunded promptly. Rush your order now.

KUMFY PRODUCTS, Dept. D-205, Cincinnati 25, Ohio

Sand Casting—Forging—Heat Treating—Case Hardening
BRONZE FOUNDRY



is again available in limited quantity without priority. Orders filled in sequence as received. INVENTORS-SCHOOLS-CRAFTSMEN use FOUNDRYETTE for making castings quickly for new inventions, for instruction, and general purpose. Order now for early delivery. Three sizes are available capable of making bronze castings of $1\frac{1}{2}$, 3, and 6 pounds weight, aluminum, copper, brass, etc. \$17.50, \$24.00, \$34.50, f.o.b. Kansas City. Domestic gas supply and 110 volt AC or DC energy required for operation. Write for circular.

KANSAS CITY SPECIALTIES CO.
Box 6022, Dept. S-62 Kansas City, Mo.

BUILD IT YOURSELF!

Complete 30 Watt Amplifier Set with all the necessary parts including tubes (less speaker), chassis, etc. with large pictorial print. Send stamp for giant catalog.

UNITED RADIO CO., 58-A Market St., Newark 1, N. J.

Big 36" Industrial Training Models \$1.50 per kit

Great for Quick, Inexpensive Learning of Theory, Design, Construction and Flight.



Piper Cub 1.50
Kit T-94 . . .

BLACK WIDOW The U.S. Super Night Fighter Kit T-155 1.50

World's Biggest \$1.00 Values in Glider and Gas



Biggest \$1.00 Model in U.S. \$1.00
84" Super Condor Soarer. Soars for hours. Kit E-5019

CATALOG 5c
(Circular Free)

If your dealer can't supply you, order direct. Including 20c extra for packing-postage.

CLEVELAND MODEL & SUPPLY CO.
★ 4508F6 Lorain Ave., Cleveland 2, Ohio, U. S. A. ★

YOU CAN'T BEAT
this to relieve Itching of
**SKIN and SCALP
IRRITATIONS**

**So
Many
Druggists
Say!**



Here's a Doctor's formula — Zemo — a stainless liquid which appears invisible on the skin — yet so highly medicated and soothing that the first applications promptly relieve itching, burning of Eczema, Psoriasis and similar skin and scalp irritations — due to external cause. Zemo ALSO aids healing.

Apply clean, stainless, invisible Zemo any time. It won't show on skin. Buy Extra Strength Zemo for mean cases.

ZEMO

**New HOSPITAL and
SURGICAL POLICY
Protects Whole Family**

**Costs Only 3c a Day for Adults
Only 1½c a Day for Children**

IT'S HERE! The new Family Hospital and Surgical Policy that insures whole family — mother, father, children, anyone now in good health, age 3 months to 65 years. Provides CASH to help pay for these bills: for hospital room and board up to 90 days for each Insured person in any one year; for other hospital expenses, such as medicines, X-ray, operating room, etc.; for doctor's fee for operations. Money Paid Direct to you — you select your own doctor and hospital. This special-value Policy issued at family group rates by Sterling Insurance Company, the reliable company with over \$2,000,000 surplus for policy holders. Investigate! Send no money, but mail the coupon below quick for 10-day Trial offer. No agent will call on you. NO OBLIGATION. ACT TODAY!

STERLING INSURANCE CO.

4538 STERLING BLDG., CHICAGO 11, ILL.

Send me 10-Day Trial Offer of LOW-COST Family Group Plan for Hospital and Surgical Insurance.

Name _____

Address _____

City _____ State _____

**UGLY
BLACKHEADS
in OUT
SECONDS
with**

**VACUTEX
BLACKHEAD
EXTRACTOR
\$1.00**

EVEN
THESE
..EASILY



Blackheads are ugly, offensive, embarrassing. They clog pores, mar your appearance, invite criticism. Now your blackheads can be removed in seconds, scientifically, and easily, without injuring or squeezing the skin. VACUTEX creates a gentle vacuum around the blackhead, cleans out hard-to-reach places in a jiffy. Germ laden hands never touch the skin. Simply place the direction finder over your blackhead, draw back extractor... and it's out. Release extractor and blackhead is ejected. VACUTEX does it all! Don't risk infection, order today!

**SAFE • SURE
SANITARY
DAINTY
FAST
PLEASANT**

10 DAY TRIAL COUPON

Balco Products Co., Dept. A-1101
19 West 44th St., New York 18, N. Y.

Enclosed find
\$1.00 Send me
Vacutex postpaid.

Ship C. O. D. I
will pay postman
\$1 plus postage.

My dollar will be refunded if I am not delighted.

NAME.....

ADDRESS.....

SORRY NO C.O.D.'S OUTSIDE U.S.A.

AIR
RIFLES

BENJAMIN

AIR
PISTOLS

ORDERS NOW ACCEPTED

EARLIEST POSSIBLE DELIVERY REALLY ASSURED—ACT NOW!

Order Latest Models Benjamin Air Rifles & Benjamin Air Pistols at once. Send for our free illustrated folder and complete Specifications today. Benjamin H-C Pellets are available. BENJAMIN AIR RIFLE CO., 811 MARION ST., ST. LOUIS 4, MO.

KEEP WARM! SAVE FUEL!

Mortite

• Seal your home against drafts and cold, stop those expensive heat leaks! It's easy with MORTITE, the pliable, plastic tape which goes on quickly, is effective immediately. You need no tools to apply. Simply press MORTITE into place around windows, doors, baseboards, etc. You'll be surprised at the difference it makes. MORTITE also keeps out dust and dirt, fills cracks, etc. Roll, about 80 ft., is enough for 5 windows.

Get MORTITE at hardware, paint, dept. stores and lumberyards.

ASK FOR FREE J. W. MORTELL CO.
MORTITE CIRCULAR 534 Burch St., Kankakee, Ill.

\$1.25

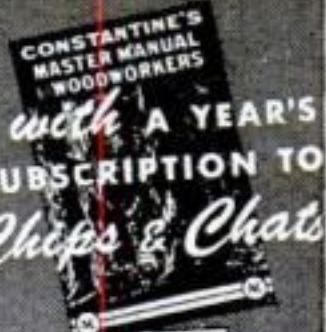


KEEP YOURSELF UP-TO-DATE ON
WOOD VENEERS LUMBER & SUPPLIES

**with
CONSTANTINE'S
MASTER MANUAL**

Published by the leading suppliers to woodworkers, the most complete book ever offered. More than a catalog, contains valuable information on lumber inlays, veneers, wood finishing, etc. 83 inlay border designs in full color, 6 pages of full color inlays plus a wood identification chart showing over 60 rare woods in natural color. Send only 25¢ today and we will include FREE a year's subscription to our publication, Chips & Chats.

ALBERT CONSTANTINE & SON, INC.
793-W 135th STREET, NEW YORK 54, N.Y.



with A YEAR'S
SUBSCRIPTION TO
Chips & Chats



SHAPER & SASH CUTTERS

Saw Blades, Mortise Chisels, Boring Tools, Jointer, Planer Moulding Knives, Dovetail Cutters, Countersinks, Dowels, Vises, Arbors, Complete Line of Wood Shop Equipment. New 40 page large catalogue No. 102. Postpaid 10 cents, allowed on first order.

WOODWORKERS TOOL WORKS

Quincy & Jefferson Sts. Chicago 6, Ill.

**TALK-SING-PLAY
thru your own radio**

RADIO MICROPHONE \$1.49

BROADCAST your voice on programs coming through your radio set. Make announcements from any part of the house. Inject wise cracks, josh and mystify friends. Play music, make announcements, and practise singing over your radio. **RADIO MIKE** is made for home use, attached to any radio in a jiffy. Not a toy. Put on your own program at home, parties, club affair, etc. Barrels of fun. Metal construction, about 5 inches high. Postpaid..... \$1.49

Johnson Smith & Co., Dept. 105 Detroit 7, Michigan



King of ELECTRIC SWITCHES



**Versatile Switch of a Thousand Uses
Millions in Post War Applications**

Floodlights your porch when the door is opened—sounds alarm when window is opened—signals arrival of mail—controls heating of furnace—filling of water tank, these and many other services are performed by this versatile switch. Shipped with instruction sheet showing numerous illustrated uses for this device at the low price of \$1.00 postpaid.

KING PRODUCTS COMPANY

BATAVIA 1, ILLINOIS

BURNED OUT or BROKEN ELECTRIC

**HEATING ELEMENTS REPAIRED
WITH NEW AMAZING NICHROCITE**

Simply overlap ends, apply Nichrocite Paste and turn on current. Used by large utility companies. Trial order, \$1.00; 4 oz., \$2.50; 1 pound, \$8.00. Armstrong Mfg. Co., Bx. 861-B, Minneapolis, Minn.



SALESMEN FOR CITY AND COUNTY

Nationally Known Manufacturer

Build up a business of your own with Nationally Advertised Products bearing Underwriters' label. Sell to schools, factories, service stations, warehouses, hotels, restaurants, public institutions, truck and bus companies, grain elevators, house trailers, autos, farms, homes, etc. **Capable man can earn real money.** Established in 1916. Write letter with details, age, experience, etc.

THE FYR-FYTER CO.,

Dept. 92-13

Dayton 1, Ohio

POPULAR SCIENCE

SOLDERING Simplified

with this revolutionary gun-type iron

INSTANT



pats.
pend.

HEATING—Fast Handling

The streamlined BAKER Flash will do the work of several ordinary type irons—faster, easier, more economically. Instant heating, high or low heat as desired, by control of your "trigger finger". Hot only when actually soldering. Non-tiring, protected gun grip and perfect balance for easy, steady application. Unexcelled for work in close places. Operates from standard storage battery or plug-in with 110-volt transformer. AT OUR DEALER OR \$4.75 Postpaid. With HT Transformer \$9.95—Remit with order unless C.O.D.

BAKER-PHILLIPS CO., 3053 Lyndale S., Minneapolis 8, Minn.

WOOD WORKERS

Lumber—Plywood Available

Harold Hunt wants to send you big revised No. 14 Catalog, 124 pages of woodworking ideas, 12 pages of rare woods in colors. UNEQUALLED BARGAINS in imported and American woods, supplies. Send only 10c to cover postage and handling. Those already holding this catalog—send for revised sheets.

CRAFTSMAN WOOD SERVICE CO.
2729 S. Mary St., Dept. B-65, Chicago 8, Ill.

only
10¢



HOUSE PLAN TEMPLATE

Made of clear sheet plastic, with accurate cut-outs for drawing door-swing, plumbing and electric fixtures, fireplace, stairs, moldings, roof-pitch, etc. Standard $\frac{1}{4}$ " = 1'-0" scale.

\$1.50 POSTPAID

TIMELY PRODUCTS CO.
Box 206E, Columbus, 9, Ohio

ROLL FILM

No limit at present

Size Price

127	- 27c
120	- 33c
620	- 33c
116	- 38c
616	- 38c

Made to exacting U. S. Government standards, this fine tested war surplus film has just been released. Panchromatic high speed. 8 exposures. Orders filled by return mail. Please order a minimum of 4 rolls. Include 18c to cover postage and handling. No C.O.D.'s please. Refund on request. We suggest you send us your order today.

Howard West, 3 W. 42 St., New York 18, N. Y. Dept. B1



59c

COMB-A-TRIM THE NEW QUICK TRIMMER

Something New! Trim your hair without any experience. It's easy! The excess hair comes off smoothly and easily by just pulling trimmer through hair like an ordinary comb. Also removes hair from legs—armpits. Save on hair-cut bills . . . Trim your own hair or the whole family's. Send 59c and your Comb-A-Trim will be sent at once.

SPECIAL OFFER

Send \$1.00 for 2
Comb-A-Trims
and save 18c.

2 for \$1

COMB-A-TRIM CO.

Dept. J-2

Cincinnati, O.

1734 Carew Tower

5 Extra Blades
(Year's Supply) 25c

JANUARY, 1946

MILL IT ON YOUR LATHE

WITH A

PALMGREN MILLING ATTACHMENT

Now — you can do milling, slotting, grinding, grooving, squaring shafts, sawing at angles, and many other important operations on your lathe. PALMGREN MILLING ATTACHMENT is a necessary fixture for small shops, schools and emergency work in large plants. Fits South Bend, Atlas, Craftsman, Logan, Sheldon and all other makes. It has 360° graduation for rotary angle adjustments, also graduated feed and adjustment screw. Easily mounted by straddling lathe's regular tool post. Try one—it will quickly pay for itself.

IMMEDIATE DELIVERY

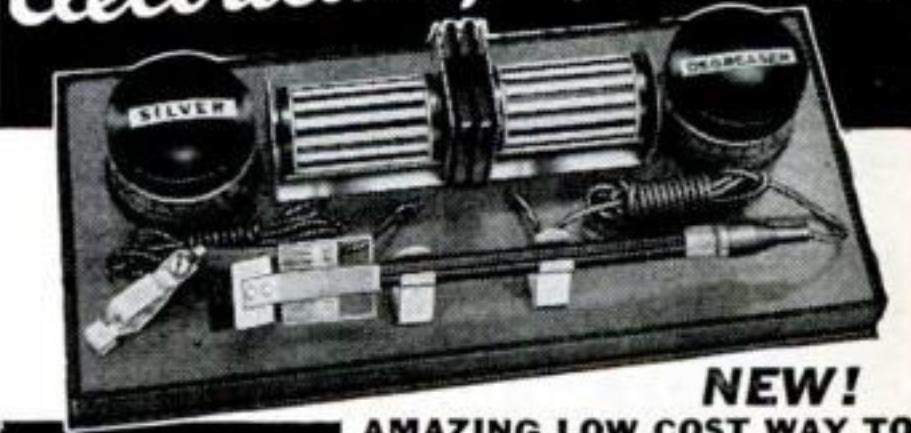
No.	Width Jaws	Depth Jaws	Jaws Open	Weight Pounds	Base Opening	Price F.O.B. Factory
150	1 1/2"	1"	1 1/2"	6 1/2	1"	\$18.75
250	2 1/2"	1 1/4"	2 1/4"	11	1 1/4"	24.75
400	4"	1 1/2"	4"	25	2"	39.75

Order from your dealer or jobber. Write for circular No. 349

CHICAGO TOOL AND ENGINEERING CO.
Mfrs. of PALMGREN PRODUCTS for Over 25 Years
8396 South Chicago Avenue • Chicago 17, Illinois



SILVERPLATE Electrically by Brush!



NEW!

AMAZING LOW COST WAY TO PLATE GENUINE SILVER ON Models, Projects, Worn Fixtures

Hundreds of uses for this complete Silverplating Outfit! New, patented electrified brush and concentrated compound of **Atomic Silver** work like magic. Easily and quickly, you can apply a heavy, permanent coat of *Genuine Silver* to any conductive surface . . . on models, projects, silverware, jewelry, etc. Outfit includes Degreaser, **Atomic Silver Compound**, Battery Power-Pack, Nylon-Lucite Electrolytic Brush, **Solid Silver Anode**, Leads, Connectors and simple Instructions in compact carrying case. All at amazing low cost! Small shipping charge collected on delivery. ORDER TODAY.

HOME CRAFTERS, Dept. E-1
360 NORTH MICHIGAN AVE.
CHICAGO 1, ILLINOIS

**ONLY
\$12.50**

The Tool of A 101 USES



TAKE A TIP from the CHAMPS...



USE NORTHLAND SKIS

Champions choose Northlands because they bring out the best in a skier. Precision-balanced for extra control . . . extra confidence. Look for the Deerhead trademark.

★ FREE! Northland's helpful 48 page ski manual. 82 illustrations. (Offer does not apply in Canada)

NORTHLAND SKI MFG. COMPANY

94 Merriam Park

St. Paul 4, Minn.

World's Largest Ski Manufacturers

Fine PLYWOOD

CAN ADD BEAUTY AND VALUE TO YOUR WORK!

People will double their admiration of your work when you give it the beauty advantage of Carmen-Bronson fine plywoods—Mahogany, Walnut, Curly Birch, Bird's Eye Maple, Havello! We offer a large selection of cabinet and paneling plywood in thicknesses from 1/32" to 1" in many standard and popular panel sizes. Also wide assortment of thin Aircraft bending stock and wood items and supplies for your workshop. Send 10c today for our complete catalog. Address Dept. A-1.

CARMEN-BRONSON CO.

165 EAST 3RD ST., MT. VERNON, N.Y.

RIGHT TO THE POINT!



Every "Yankee" spiral screw driver is right to the point. Every part is ingeniously designed to speed work, cut down man-hours. Pains-taking design and simple strength are typical of all "Yankee" fine mechanics' tools . . . whether Tap Wrenches, Vises, Automatic Drills, or Bit Braces.

"YANKEE" SPIRAL SCREW DRIVER No. 130A
A Size for Every Purpose

BIG MONEY NOW IN LIQUID MARBLE

THREE wonderful new opportunities for your own big money-making business — regardless of your age, sex, or previous experience!

1. LIQUID MARBLE. Make beautiful artificial Marble Slabs. Pour from liquid state. Glazed or unglazed. This marble may be mottled, veined, multi-colored or left in original snow-white state. The color is actually a part of the marble! Does not fade or wear away. Liquid Marble is unsurpassed on kitchen or bathroom walls. Easy to make and install.

2. PLASTIC FLOORING. May be made in any color or combination of colors. Gives a lifetime of wear. Dustproof, Soundproof, Vermin-proof. Resilient to the tread. Lay out solid from wall to wall or in pattern design of various shaped blocks.

3. FLEXIBLE MOLDS. For plaster casting. Make your own moulds for few cents each. \$1.00 in raw materials will make up to \$25.00 worth of finished goods. We furnish names of buyers. Write now for FREE information about our **BIG THREE** money-making opportunities! Get in on busy season just starting. Send penny postcard or letter. No obligation.

COMPO-TEX, Box 786-G, ST. LOUIS 1, MO.

Balance 4" x 9" Base. With either \$6.00 Metric or Avoirdupois Weights . . .

Catalog with 3000 illustrations of laboratory Apparatus sent for 75 cents. Catalog listing 10,000 chemicals, drugs, minerals, etc., and 1700 scientific books sent for 25 cents. 100 scientific books, 10 cents.

LABORATORY MATERIALS CO.
7317 Vincennes Ave. Chicago 21, Ill.

WATCHES WANTED BROKEN OR USABLE

—all kinds, even Ingersolls. Highest prices paid for jewelry, rings, spectacles, gold teeth, etc. Cash mailed promptly. Write for Free Shipping Container.

Lowe's, Holland Bldg., Dept. PS, St. Louis 1, Mo.

**New - Improved
OIL FOR ALL ---
HOUSEHOLD-SPORTSMAN-MECHANIC
Lubricates - Prevents Rust - Cleans Metal**

3 oz.
40c

FIEND OIL



RHEUMATISM

ARTHRITIS - NEURITIS - SCIATICA
Why continue to suffer the agonizing pains of these diseases when the usual remedies have failed? Learn about a new trustworthy, modern treatment method. This marvelous treatment is completely explained in the Ball Clinic's FREE Book. Write today. No obligation.

BALL CLINIC, Dept. 5100, Excelsior Springs, Mo.

"The Book They're Talking About"
Contains over 350 illustrations, charts and notes

**ART ANATOMY
OF THE HUMAN FIGURE**

For the Amateur and Professional Artist and Sculptor. Giving detailed study of every part of the Male and Female body. Printed and in rhythm. Outside U.S.A. send \$1.25. **ONLY \$1.00**

MAJOR BOOK CO., Dept. 32-B, FOREST HILLS, NEW YORK

LEPAGE'S PAPERHANGER'S PASTE
LEPAGE'S GLUE
LEPAGE'S PAPERHANGER'S WALL SIZE

"YANKEE" TOOLS

make good mechanics better

North Bros. Mfg. Co., Phila. 33, U.S.A.
Established 1880

Makers, also, of "Yankee-Handyman" Tools

BELL
GUARANTEED
WATCHES

WATERPROOF-SHOCKPROOF

Anti-magnetic, radium dial and hands, stainless steel back, unbreakable crystal, precision tested.

No.GW195 15 jewels, small second hand.....	\$25.95
No.GW212 17 jewels, sweep second hand.....	\$42.50
No.GW189 SELF-WINDING 17 jewels, sweep second hand.....	\$49.50

Mail Orders Promptly Filled. Postpaid. Fed. Tax Incl.
Write for Free Illustrated Booklet "GW"

BELL WATCH COMPANY
Time and Life Bldg., Rockefeller Center, New York 20, N. Y.

BUILD ARC WELDER FROM OLD GENERATOR

For Light or Heavy Work. 75-200 amperes. Complete PLANS 35c. Send today and we'll include FREE our BIG Catalog. LEJAY Mfg. Co., 1323 Lejay Bldg., Minneapolis, Minn.

Everything in Radio!

Make Radolek your buying headquarters for Radio-Electronic repair and replacement needs. Large stocks assure finest, most complete selections of all available items at lowest prices. Your orders receive special attention for fastest delivery. Send today for FREE Radolek Buying Guide.

RADOLEK CO., Dept. A-110, 601 W. Randolph St., Chicago 6, Ill.

FREE RADIO BUYING GUIDE

Cabin PLAN BOOK-\$2.00

HEALTH and FUN for YOU, whether in Sunny California or Rugged Maine

- A multitude of ideas for practical, low-cost cabins and cottages. Pictures and floor plans. Suggestions for fireplaces, barbecue pits, built-in furniture. Plans for row-boats, docks and floats.
- Complete drawings and lumber lists for a build-your-own \$500 cabin or \$2500 2-bedroom cottage.

BUILD-YOUR-OWN for next season's healthful fun, now! Send check or money-order for \$2.00, today. Copyrighted '45 W-B-Co.

WOODBECK PUBLISHING COMPANY
GRAND RAPIDS - MICHIGAN

Worth hundreds
of dollars to YOU...
tells you how to redesign
for **ARC WELDING**

Estimating charts and work page opposite every design increases practical value.

OVER 300 suggested basic designs

If you work in metal—are a Designer, Engineer, or have any redesign problem—"Practical Design for Arc Welding" is the book that will show you plenty of ideas to help solve your difficulties. Estimating charts help you analyze your redesigning plans in terms of cost, production, sales advantages, and leaves nothing to doubt.

Convert Ideas Into Cold Facts

After going through "Practical Design for Arc Welding" you'll discover hundreds of applications that cut costs, add strength and improve your production through arc welding. You'll save hours and dollars with these books.

Available in 3 Vol.

Each volume is complete in every respect. Only \$3.50 per volume, or all 3 for \$10.00. A real bargain to help improve your post-war position. Mail coupon today!

HOBART
BROTHERS CO.
Box P-16, TROY, O.
"One of the World's Largest Builders of Arc Welders"

FREE!

"Vest Pocket Guide for Arc Welders."

REACH FOR YOUR SCISSORS

Send me detailed information on Hobart Arc Welders, together with books I've checked.

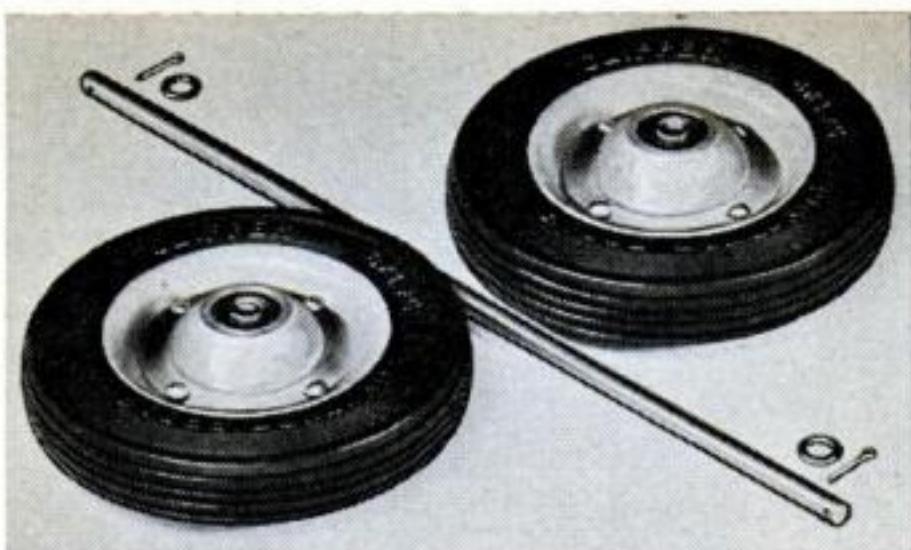
- Welding School
 Attached find \$ _____ for _____ volumes
 "Vest Pocket Guide" of "Practical Design for Arc Welding."

HOBART BROS. CO., Box P-16, TROY, OHIO

NAME _____

FIRM _____

ADDRESS _____



WELLER WHEELBARROW WHEEL KIT . . \$8.00

One 8 x 1.75 Wheel, Axle and Fittings, complete.

SAME KIT with two 10x1.75 wheels, axle and fittings—\$12.00

These mechanically perfect WELLER Wheel Kits are ideal for building Coaster Wagon, Four Wheel Truck, Soap Box Racer, Garden Truck and for many farm uses. Wheels made of cast aluminum, fully ball bearing; newest semi puncture proof tires. Axle in 3 sizes— $\frac{1}{2}$ ", $\frac{5}{8}$ ", $\frac{3}{4}$ ". Wheels and axle load tested for 200 lbs. per wheel. Ideal for light industrial purposes.

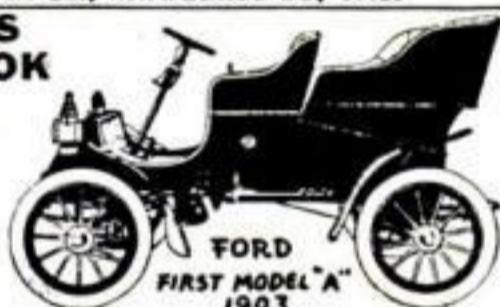
Sold direct by manufacturer. ORDER TODAY—cash, money order or C.O.D. When ordering be sure to specify size, number of wheels and axles.

WELLER PRODUCTS INC.

Dept. PS, 2307 N. 34th St., Milwaukee 10, Wis.

FLOYD CLYMER'S MOTOR SCRAPBOOK

Read about early Fords, 250 other early cars in these unique, historical books. Contain ads, photos, descriptions, specifications. "A MUST" says TIME Magazine. Scrapbook No. 1, 2 & 3, \$1.50 each; 100% Steam Car Edition, \$2.00. Postpaid. Cloth-bound. \$1.00 extra. All books different. Catalog of motor books, 10c.



CLYMER, Dept. P, 2125 W. Pico, Los Angeles, Calif.

STOKER EMPTIES OWN ASH!

A remarkable stoker already used by thousands of home owners—fits into any furnace or boiler. Manufactured since 1934. So automatic it takes the coal from your present coal bin through a pipe to the furnace, going around corners if necessary. Keeps house at even temperature, empties its own ash in sealed containers, no coal to shovel, no clinkers to dig, only bituminous stoker of its kind on the market. Send for full information NOW!

POCAHONTAS FUEL COMPANY INCORPORATED
341 EAST 131st STREET • CLEVELAND 8, OHIO



WELD ANYTHING
ANYWHERE
ANYTIME

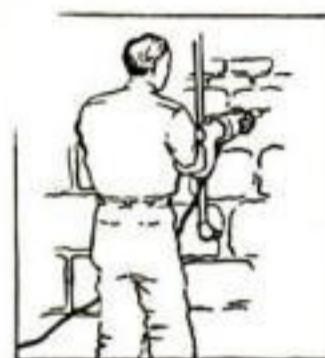
ALL PURPOSE ARC WELDER

9 Models . . . 32 Volt D.C., 110 to 440 A.C.

* A complete workshop in itself! Weld, cut, braze or solder any type metal; iron, castings, aluminum, steel, bronze . . . in any gauge or weight, with equal ease. Compact, complete, as sturdy as the Rockies. Formed steel and cast aluminum case, welded steel base, 4" cast wheels. Built with voltage control. Better on R.E.A. lines. Completely equipped. No instructions needed. Sold throughout the world. Several dealer territories open. Write:

FORNEY MFG. CO.
FORT COLLINS 3, COLORADO

DURAPPOINT DRILLS



For: Concrete.
Stone. Glass.
H a r d e n e d
Steel. Scriber,
carbide-tipped,
\$2.50 postpaid.

Durapoint Drill Company,
4342 Umatilla Street,
Dept. S. Denver 11,
Colorado



What Every Mason Wants



We have Important Masonic books for Blue Lodge, Chapter, Commandery, Scottish Rite, and Shrine.

OUR RITUALS ARE USED THE WORLD OVER

Send for free catalog of books and rituals for Masons, Odd Fellows, Knights of Pythias, Knights of Columbus, etc.

EZRA A. COOK, Publisher, P. O. 796, R.J.Y. Chicago 90, Ill.

RADIO PARTS GRAB BAG!!

\$25 value assortment of Coils, Condensers, Transformers, Resistors, Controls, etc. An experimenter's dream. While they last, only.....

MARKO SUPPLY, Dept. P.S. 1
2924 Logan Blvd.

\$3.98

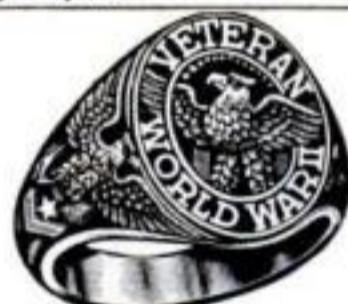
Chicago 47, Ill.

NEW! Ideal Gift for
Your Service Man!

Heavy 10K Solid Gold Souvenir Service Ring of World War II. A beautiful and authentic ring that your service man will be proud to wear and cherish forever. It plainly shows that he is a Veteran of our Armed Forces of World War II. Available in all sizes. We pay postage and Fed. Tax.

No. 1214 10K Solid Gold \$18.00
Solid Sterling Silver . . . \$6.00
Send for Circular of Service Jewelry.

EDWIN W. LANE CO., Dept. PS, 32 W. Randolph St., Chicago 1.



LIQUID MARBLE

FLOORING—Dustless, noiseless; put on like plaster, plain or tile designs; yielding as cork, lasting as stone. RUBBERPLASTIC Mold Compound—For plaster casting, novelties, statuary, toys, plaques, dolls. COLORED POTTERY—Birdbaths, garden furniture, vases. TILEX ROOFING—Tile-like colors. Illustrated literature and Free Catalog Other Compositions of cement, sawdust, asbestos, paper, etc.

MARBLEIZING SERVICE, Dept. 12-A, Edwardsville, Illinois

When Writing Advertisers Please
Mention Popular Science Monthly

ANALYZE HANDWRITING

Qualify for Certified Grapho-Analyst Degree. New uncrowded, fascinating field of service. Gratifying earnings reported by graduates in Employment, Credit, Social Service, Police and Judicial, and Entertainment fields. Others have developed profitable private practice, full or spare time, as Personal Problem and Vocational Counselors. Send for 3000 word test lesson and Grapho-Analyst FREE.

ADDRESS A. I. G. A. Inc.

126 NOEL, MO.

FREE

POPULAR SCIENCE

**EASY to
PLAY**



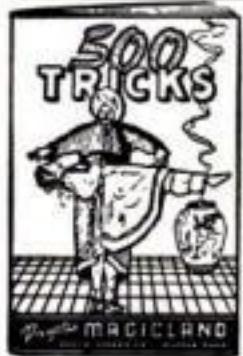
**Order
Yours TO-DAY**

The New Luellen
HARMONICA

Most wonderful pocket instrument ever made is the harmonica. Easy to master, fun for Everyone. The Luellen has 10 holes, 20 notes. Key of C. **\$2.10** Beautiful tone. Now ready. Postpaid Only

INSTRUCTION BOOK. Simple for youngest child. No notes, scales nor exercises. Ten lesson charts show everything. Includes 75 popular songs. Price **\$1.00**. Here's our special introductory offer: The Instructor and the Harmonica, both postpaid, both for **\$2.69**. Send Check or Money Order Today.

JOHN LUELLEN & CO., 17034 Page Avenue, Dept. 104, Hazelcrest, Ill.



**It's FUN to do
MAGIC**

Amaze—Mystify—Entertain. Be popular. Enjoy this fascinating hobby. Only 10c brings you our famous Catalog No. 25 of 500 tricks containing the latest in magic for pocket, parlor, stage. Over 25 years in business. We ship everywhere. Send 10c today.

DOUGLAS MAGICLAND,
Dept. S, Dallas 1, Texas

BE OUR PERFUME DISTRIBUTOR BIG MONEY

We have all the fast selling cosmetic items that make you big profits: Perfumes, Colognes, Sachets, Powders, Creams, etc. Attractive line, low prices. **SELL STORES, JOBBERS, OR DIRECT.** Quality items are still scarce but we have adequate supplies for prompt shipments. Big opportunity. Start today. Free details and sample.

TOWER HALL, Dept. 423E, Manhattan Bldg., Chicago 5, Illinois

LUCITE SHEETS, RODS, Dip Dyes, Laminating Dyes, Cement, Buffers, COMPLETE SUPPLIES.

Prices, complete instructions, FREE. Lucite sample 35c
MAURICE LANNON, P.O. Box 686, No. Hollywood, Cal.

Burn Your Name On Tools **Electro Name Etcher** Only \$1

PROTECT valuable tools from thieves and tool borrowers! Electro Etcher BURNS your name, any design, permanently on tools, instruments, dog collars, any metal. Easy! Simple as writing with pen or pencil. Rush order today—supply limited—no more when these are gone! **SEND NO MONEY!** Pay postman \$1.00 plus few cents postage on delivery. Use 5 days—money back if not delighted. **Electro Etcher, Dept. C-603, Strader Ave., Cincinnati, O.**

NOW Repair your own **ELECTRICAL APPLIANCES** with CHANITE Self-Welding ELECTRICAL HEATING ELEMENT flux. Generous amount, instructions enclosed. \$1.00 postpaid. Guaranteed nothing like it. Stick form 25c ea. \$2.00 doz.
CHANITE SALES COMPANY, 914 South Main, Fort Worth 4, Texas

When Writing Advertisers Please
Mention Popular Science Monthly

MONEY for MEN ALL DATA **FREE!**

THE PLASTEX Industry needs manufacturers on small scale and for big production of Lamp and Clock Stands, Art Goods and Novelties in Plastex and Marble imitation. Experience unnecessary. Plastic material makes regular 10c store sellers. Rubber moulds furnished for speed production. Small investment brings good returns. Big chain store orders now being placed. Ambitious men have chance for real prosperity. Our free booklet will interest and benefit you.

PLASTEX INDUSTRIES, Dept. 2, 1085 Washington Av., New York 56, N.Y.

WOODWORKING IS FUN



**...when
you have a
GOOD
PLANE**

A proper assortment of fine tools chosen from the Stanley line will put real fun into making things in your postwar home workshop. For example, the Stanley "Bailey" Plane—one of Stanley's 64 types of planes—will lend even your first efforts the touch of the expert. Like other Stanley Tools, this plane is better designed and balanced. It takes and holds a keener edge. And it is made to last!

Expert Help in Selecting Tools

Stanley has a free booklet for you, "The Joy of Accomplishment". Crammed full of helpful suggestions, it contains: a primary list of tools, a list of tools to be added as needed, and a list of project plans. You'll also find the big Stanley textbook, "How to Work with Tools and Wood", mighty useful. It's yours for only \$1.00. Mail the coupon today.



STANLEY

**THE TOOL BOX
OF THE WORLD**

MAIL NOW

**The Stanley Works
216 Elm St., New Britain, Conn.**

Please send by return mail—

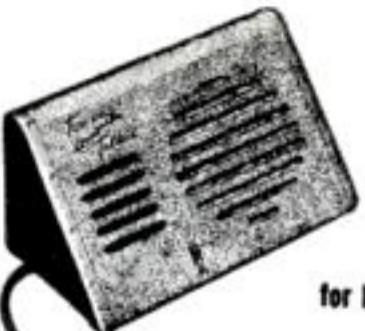
- FREE** booklet: "The Joy of Accomplishment"
 The 188-page book: "How to Work with Tools and Wood". \$1 enclosed.

(In Canada: Send order to Stanley Tool Co. of Canada, Ltd., Roxton Pond, Quebec.)

Name.....

Address.....

City..... State.....



A 2-WAY TALKIE

Simplified

for Home, Office, Factory, Store and Farm use.
Nothing to plug into the wall.

Here for the first time is a "walkie-talkie" simplified for every day use. There's nothing to crank, nothing to tune in, nothing to adjust, nor is it necessary to plug into the wall. This marvelous convenience is backed by the most famous name in inter-communication, "Dictograph". Set it up anywhere any time in a couple of minutes—talk and listen. Clear undisturbed reception right thru the loud speaker.

MOVE IT FROM PLACE TO PLACE

You have instant two-way communication whenever and wherever you want it—the year around. Here are just a few of the many uses for the "2-WAY TALKIE".

From Room To Room In The Home	From House To Garage
From Inside The House To The Front Door	From Office To Office
From Farmhouse To Barn Or Dairy	From Office To Shop
From Neighbor To Neighbor	From Doctor To Nurse
From Main House To Cabin	From Executive To Secretary
From Store To Stockroom	From Office To Store

Once you use it you will wonder how you ever got along without it.

READY FOR IMMEDIATE SHIPMENT

Order as many as you need. The sensational low price of \$17.50 is by far the lowest ever offered for genuine Inter-Communication. Guaranteed for one year and warranted against mechanical defects. Order today. Send remittance with order for prepaid delivery or send C.O.D. plus charges on receipt of 20% deposit.

UTILITY STORES

Established 1906

Dept. TPS

115 So. Wabash, Chicago 3, Ill.



REMOVES ALL FINISHES



New type semi-paste remover quickly lifts off paint, enamel, varnish, shellac, lacquer, bakelite and other synthetic resin finishes. (Removes emulsified resin water paints, too.) Stays wet longer—stays put on upright or overhead surfaces—strips clean, quick. One coat usually enough (apply with brush or spray). Contains no benzol, acid, caustic, alkali, or wax—harmless to hands, bristles, surface stripped. All sizes (pint 65c) at paint and hardware stores.

FREE CIRCULAR

"How to Remove Paints, Varnishes, Lacquers, etc." Also describes other Savogran Products: Heavy Duty Cleaner, Crack Filler, Wood Putty, Remover & Bleacher (renews floors), Paint Brush Cleaner, Coldfoam Soapless Soap Powder.

THE SAVOGRAH CO.
DEPT. 15, BOSTON 10, MASS.



NO BENZOL-ACID-CAUSTIC-ALKALI-SAFER TO USE

SAVOGRAH STRYPEEZE

IN EVERY WELL-EQUIPPED HOME WORKSHOP



It's Orange!

FOOT PAINS STOPPED

or Your
MONEY BACK



Air-Cooled ARCH-HEELERS

Get Quick Lasting Relief

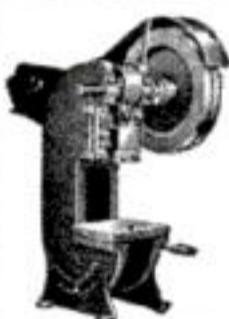


\$1
PAIR

Send No Money

Save C.O.D. by sending price with order. Money back if not pleased after 30 days. Send Today.

ARCH HEELER CO., Dept. 150, COUNCIL BLUFFS, IOWA



PUNCH PRESSES

5, 10, and 18 TON Capacity, Inclinable, Open Back, Bench and Floor Models

IDEAL FOR MAKING ALL KINDS OF METAL STAMPINGS—NOVELTIES, TOYS, CONTRACT WORK. WRITE FOR FULL PARTICULARS TO:

JOHN E. KANDLER CO., Dept. 5
210 N. Rose St., Kalamazoo 13, Mich.



PINS 30¢ up RINGS \$1.50 up

For your class or club. Over 300 designs. Finest quality. Write Dept. A, Metal Arts Co. Rochester, N. Y.

FREE CATALOG

DO YOU

Want a permanent business profession of your own? Then become a foot correctionist. Earnings of men and women in this greatly needed profession run as high as \$50-\$100 weekly after a few weeks home training—not medical or chiropody—easy terms, no further capital needed, no goods to buy. 50th year. Write for free booklet.

Stephenson System of Foot Correction, 62 Back Bay, Boston, Mass.

SEXED & MRS. BERRY'S POULTRY BOOK

BERRY'S Champion-Mated, Hand-Picked CHICKS, also SEXED, STARTED, 52 Breeds, 7 HYBRIDS, All Iowa Inspected, BWD Tested. Over 400 Prizes—30 Shows! LOW PRICES. In Business nearly 50 years. Beautiful POULTRY BOOK FREE, stamps appreciated. BERRY'S POULTRY FARM, Box 25, CLARINDA, IOWA



GET INTO CARTOONING!

Learn to cartoon! Big pay! Easy, enjoyable work! Cartoon Course, Gag Course, Anatomy Course & Business Course full of plans, markets, ideas, Drawing set and criticisms. All one low price. Rush card for details. Hartman Studios, 2438 W St., Lincoln 3, Nebr.

Today . . . ELECTROPLATING

The business of tomorrow. Learn this interesting, profitable business. Hobby or full time. Postcard brings full details, FREE. PLATER HYDE. Dept. S, P. O. Box 176, National City, Calif.

HIGH BLOOD PRESSURE A DANGER SIGNAL

Often associated with Hardening of the Arteries, a Stroke, Paralysis, Heart Trouble, Kidney Disease, and other grave complications. Resultful treating methods of the Ball Clinic have proven dependable for nearly a quarter of a century. Send for FREE Blood Pressure Book today. No obligation.

BALL CLINIC, Dept. 5160, Excelsior Springs, Mo.

BUILD THIS FREEZER AND STORAGE UNIT for less than \$50!

Easy to make. Holds thirty gallons. Zero temperature keeps meats, fruits, vegetables, etc. in fresh condition for indefinite period of time. Complete instructions, material list, and fourteen view composite photograph of construction details sent for

\$100



MASON FREEZERS, GENEVA, N. Y.

LEARN MOVIE PROJECTION THEATRE MANAGEMENT

The Motion Picture Theater Business offers big opportunities for trained men. Get into a fascinating field with a post-war future. Train at home in spare time. Free Catalog. Established 18 years.

385 Washington St.,
Elmira, New York

THEATRE INSTITUTE

IMPROVE YOUR PLAYING



PIANISTS—(also organists). Send for FREE booklet showing how you may greatly improve your technic, accuracy, memorizing, sightreading and playing thru Mental-Muscular Co-ordination. Quick results. Practice effort minimized. Used by famous pianists, organists, teachers and students. No obligation.

BROADWELL STUDIOS, Dept. 246-A, Covina, Calif.

PATENTS AND TRADE MARKS C. A. SNOW & CO.

Registered Patent Attorneys Since 1875

Write for Free Book and "Certification of Invention" form
427 SNOW BUILDING, WASHINGTON 1, D. C.

Inventions Wanted Patented or Unpatented

Inventions can now be safely sold without patenting expense. If you have a practical, useful idea for sale, either unpatented or patented, write today!

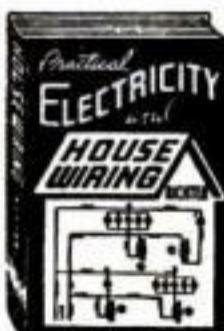
Institute of American Inventors
Dept. 3, 1926 Eye Street, Washington 6, D. C.

Practical Electricity and House Wiring

Discusses common electrical devices, principles of circuits, wires and insulation, grounding, fuses and circuits, wiring methods, planning installations, installing switches, fixtures, etc., wiring houses after they are built, alterations and additions, wiring farm buildings, home repair, etc. 200 pp.....227 illust.

C.O.D. Send Today, Money Back Guarantee Postpaid
\$1.74

GATEWAY BOOK COMPANY, Dept. PS-13
32 N. State Chicago 2, Ill.



PATENT YOUR IDEAS SEND FOR FREE BOOK

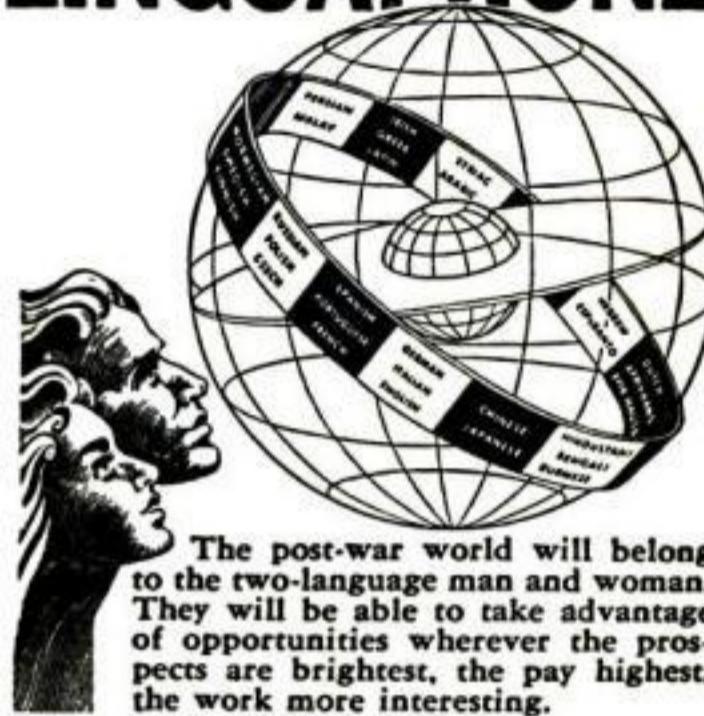
HOW
TO OBTAIN A
PATENT

Written by Former Member Examining Corps (1922-24) U.S. Patent Office.

CARL MILLER, Registered Patent Attorney
Former Member Examining Corps U. S. Patent Office

Woolworth Bldg., Dept. 16-C, New York — Bond Bldg., Dept. 18-C, Washington, D. C.

Open for yourself new world opportunities with another language by LINGUAPHONE



The post-war world will belong to the two-language man and woman. They will be able to take advantage of opportunities wherever the prospects are brightest, the pay highest, the work more interesting.

LINGUAPHONE Conversational METHOD

prepares you, *in your own home*, to SPEAK any one of 29 world-languages:

SPANISH	POLISH	GERMAN
PORTUGUESE	RUSSIAN	ITALIAN
NORWEGIAN	FRENCH	SWEDISH

and 20 other languages

You learn through natural, everyday conversation. First you LISTEN to the clear voices of native teachers . . . they speak to you as often as you wish... You REPEAT what they say... ask and answer questions, and before you are actually aware, you are conversing.

Endorsed by leading educators; used in thousands of schools and colleges, and by Army, Navy, Flying, Signal and other Services. "Linguaphone is unique . . . it has no equal."

SEND FOR FREE BOOK. Save time, work and money—become a two-language man.

LINGUAPHONE INSTITUTE

LINGUAPHONE INSTITUTE
58A-RCA Bldg., New York 20, N. Y.

Without cost or obligation please send me the Linguaphone Book.

Name

Address

City Zone..... State.....

Language interested

DRAFTING

PREPARE NOW FOR A BETTER JOB

Begin now to turn spare time into money. Become a draftsman with opportunities for advancement. Be ready to qualify for a good paying job in the bright new future ahead in America.

If you are now doing routine drafting work, prepare now for promotion to a better job in your field. Send name and address *today* for FREE information.

American School, Dept. DD146, Drexel Ave. at 58th St., Chicago 37

Name

Street

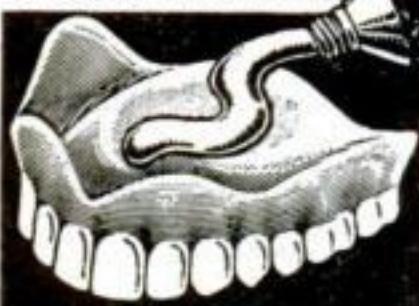
City, State

EYE-GLASSES by MAIL as Low as \$2.95
 Send No Money!
 16-Day Trial Offer
 NEWEST STYLES
 FREE Scientific Sight Test Chart and Catalog. Write today.
 U.S.EYE-GLASSES CO. 1557 MILWAUKEE AVENUE Dept. 1-42, CHICAGO, ILL.

Thanks, I can eat Steak again!

- Fit-Rite
- makes
- FALSE
- TEETH
- tight!

**REFITS and
RELINES
DENTAL PLATES!**



*Makes
False Teeth
TIGHT!*

Improved Newest
Plastic Reliner

Lasts for Months!

FIT-RITE quickly makes loose, slipping, clattery dental plates fit snugly and comfortably. Eat, talk and laugh naturally and confidently!

FIT-RITE you apply—at Home

Simply squeeze FIT-RITE on your dental plate and put it in your mouth, where it hardens and makes false teeth feel and fit like new. No fuss, no muss—no heating. Not a paste or powder. Becomes a part of plate. You apply it yourself.

FIT-RITE IS 100% O.K. ON ANY DENTAL PLATE

FIT-RITE won't harm any denture or your gums. Tasteless, odorless, sanitary—cleanses and sweetens the mouth and helps prevent gum soreness. It won't come off with scrubbing or washing. EVERY APPLICATION GUARANTEED TO LAST FOR MONTHS or NO COST.

SEND NO MONEY Send for a tube today, for only \$1.00. Use coupon below. Enjoy teeth like new again. 100% satisfaction guaranteed or money back.

FREE TRIAL Offer!

SPECIAL—generous package of dental plate cleanser included absolutely free. This instant, brushless cleanser WORKS LIKE MAGIC and will not harm any denture. Try Fit-Rite first.

FIT-RITE CO. 1573 MILWAUKEE AVENUE Dept. 1-42, Chicago 22, Ill.

Mail This COUPON

**FIT-RITE COMPANY, Dept. 1-42,
1573 Milwaukee Ave., Chicago 22, Ill.**
 Send 1 tube of FIT-RITE Dental Plate Reliner that you guarantee to satisfy 100%—or it won't cost me a penny.
 I will deposit \$1.00 plus postage with postman when package arrives.
 Enclosed is \$1.00—You pay postage.

NAME _____

ADDRESS _____

CITY STATE

P.S.: RUSH THIS ORDER TODAY!



A genuine steel pack muffler WITH A BEAUTIFUL MOTORBOAT TONE. Sandee Mufflers feature improvements far in the lead, years ahead of competition. Increases mileage and power, reduces back pressure and gives better performance. Savings in gasoline will pay for a Sandee Muffler.

V-8 FORD AND
MERCURY DUALS \$17.50

SINGLES—FIT IN PLACE OF REGULAR MUFFLER

Chev., V-8 Ford, Plym., \$5.00 Chrys., Olds., Buick, etc., \$7.00
 These mufflers will outlast two regular stock replacements.

Dealers Wanted

SANDEE MUFFLER CO.
 7523 S. WESTERN AVE., LOS ANGELES 44, CALIF.

BE YOUR OWN BOSS! BIG PAYING PROFESSION MECHANICAL DENTISTRY

G. I. APPROVED

Big Post war demands for trained Dental Technicians! Start Now! Learn this profitable profession.

Visit Us or Write for Free Booklet "P.S.-1"

NATIONAL SCHOOL OF MECHANICAL DENTISTRY
 10 W. JACKSON BLVD., CHICAGO 4, ILLINOIS

S WINDOW SIGN LETTERS
 For Store Fronts and Office Windows. Anyone can put them on. Samples furnished. Genuine gold and silver.
METALLIC LETTER CO., 441 N. Clark, Chicago 10

When Writing Advertisers
Please Mention Popular Science

DENTIST'S NEW DISCOVERY MAKES FALSE TEETH FIT!

YOU can make your plate stay in place. Easy. *Perfect Fit Guaranteed.* Write for details. Dr. C.N. Reese, DENTIST, Box 268B, Winnetka, Ill.

120 MILES PER GALLON

Complete motor ready to mount on ordinary balloon-tired bicycle. No mechanical skill required to install. No alteration of bike necessary. Easy to operate.

Can be pedalled by merely releasing clutch. Speed 5 to 40 M.P.H. Shipped pre-paid complete with 4 cycle, 2½ H.P. motor, all attachments and heavy duty stand. Get complete facts about this low-cost, convenient transportation...

Write today for descriptive illustrated literature.

WHIZZER MOTOR SALES CO.
 Dept. B, 3132 E. Washington, Los Angeles 23, California

SPPland

Since 1837

Chronograph

THE FIVE-IN-ONE WATCH

Telemeter • Tachometer
Stop Watch • Time Keeper
Time Out Stop Watch

AT BETTER JEWELERS EVERYWHERE



BREATH TAKING BEAUTIES!

IN FULL COLOR FOR ART STUDY



World's
Finest
Viewer

Thrilling, colorful
transparencies of
beautiful Hollywood
Models... so real...
so lovely they'll take
your breath away.



See For Yourself
1 Full Color 35mm. Slides
ONLY \$1.00

HOLLYWOOD PROFESSIONAL VIEWER

Life-like, crystal clear magnification comparable to theatre screen projection. For 35 mm. slides, strip film and 8 or 16 mm. movie film. ★ Special Combination Offer—Two exquisite transparencies of lovely Hollywood Models and sensational Hollywood Professional Viewer — BOTH FOR ONLY \$3.50.
Studio Guild, Dept. S, Box 830, Hollywood 28, Calif.
 Send Special Combination Offer for only \$3.50 Find enclosed \$_____
 Send 2 full color art Model slides for only \$1.00 Send C.O.D.
IF MONEY ORDER OR CHECK IS ENCLOSED WITH ORDER, WE WILL PAY POSTAGE

Special
Combination
Offer
2 Any Model
Slides and
Hollywood
Professional
Viewer
\$3.50

3 OUTSTANDING, TIME-TESTED DRILL PRESS ACCESSORIES

THE BARRON ROTARY SURFACE SANDER

\$5.95

COMPLETE



Note these Special

Features—Made of Alcoa aluminum. Machined and balanced for smooth operation in drill press chuck. For surface sanding woods, plastics or polishing metal surfaces. Complete with 20 instantly removable sanding cup discs. No messy glueing needed. Leaves an agate smooth, absolutely true surface finish. Does not leave waves, ripples, steps or striations in work piece. The only tool of its kind. Shipped prepaid on 10 DAY MONEY BACK GUARANTEE for \$5.95.



The IMPROVED Barron Multi-Purpose Drill Press Planer.. \$7.50

Not only surface planes toughest woods and plastics to precision limits—but rabbets, routs, tenons, panels, grooves, beads. Will cut rabbets, tenons, panels, etc. to a depth of 1" with special Barron extra long hi-speed cutter blades. Thousands now in use. Made of Alcoa aluminum, machine finished thru-out. Vibrationless. Fits any drill press. Shipped prepaid on 10 DAY MONEY BACK GUARANTEE on receipt of cash, money order or C.O.D. for \$7.50.

Barron ALL-METAL Auxiliary DRILL PRESS Table \$8.85



Hard Alcoa aluminum die casting heavily ribbed—machined both sides. Has 234 sq. inch extra large working surface. Equipped with Barron Steel Planer Fence. Can also be used for shaper operations, innumerable other drill press uses. A real buy at \$8.85, express collect.

See Your DEALER . . . Or Write For CATALOG

BARRON TOOL CO., INCORPORATED
370 Architects Bldg. Detroit 1, Mich.

BARRON PRECISION WORK SHOP **TOOLS**

BUILD Boucher MODELS

CLIPPER

TANKER

FREIGHTER

Everything for the Model Ship Builder Since 1905

34 Different
Model Kits
\$5 to \$35

Send 35c for 96
Page Illustrated
Catalogue

BOUCHER SHIP MODELS 36 EAST 12TH ST. NEW YORK, N.Y.

TRAILER AXLES, HITCHES, AND PARTS

If you are interested in purchasing trailer axles, hitches, and other trailer parts, contact us promptly. Complete house trailer blue prints, \$1.00. Write for free literature
HAMMER BLOW TOOL COMPANY, Dept. D-5 WAUSAU, WIS.



THERE'S PROFIT in ELECTRICITY—LEARN from PRACTICAL ELECTRICS, \$1.00



Whether you want to enter the electrical field as a profession—or whether you want to know more about fixing electrical gadgets around the house, you will find Practical Electrics a profitable investment. You can find the right answers quickly. It gives you the

fundamentals of electricity, electrical circuits, motors, transformers, electrical symbols, trouble shooting, etc.—all in plain, simple, understandable language. Send \$1.00 today for a copy of Practical Electrics, the ready reference book of electricity.

AUTOPOWER, INC., 2118 PINE STREET, ST. LOUIS, 3, MISSOURI

CARBIDE SCRIBER NON-MAGNETIC

FOR HARDEST STEEL, GLASS, ETC.

Tungsten Carbide — the hardest metal made by man — carefully ground on diamond laps, brazed into stainless steel 6" handle for marking steel and other metals — for etching, marking, cutting glass. Cuts all directions. Easy to follow any contour. In plastic case with pocket clip.

LUCAS-MILHAUPT ENGINEERING COMPANY

6051 S. LAKE DRIVE
CUDAHY, WISCONSIN

\$2.00

PRICE FOB MILWAUKEE

OFFERS LOW COST LIFE INSURANCE

Postal Life offers \$1724. in Protection for \$2.00 monthly (age 21). Other Ages in Proportion

THIS PREMIUM HALF PERMANENT RATE

Policy Fully Paid-up in 30 years

NEW YORK, Saturday. Postal Life of New York, unique among important Old Line, Legal Reserve Life Insurance Companies, is again offering this special modified policy, already owned by thousands of American families. You pay half the permanent rate until the 6th year; \$2.00 monthly for substantial amounts of Protection, depending on age! \$2.00 monthly pays for \$1754. of life long protection at 20; \$1142. at 40; \$5.00 monthly buys \$3650. at 30, etc. Proportionate amounts at other ages. You pay no premiums after 30 years; policy fully paid-up and in force your entire life.

For your convenience we print below a coupon that can be clipped and sent to Postal Life. Full information, rates, etc., will be sent to you promptly. There is no obligation to buy but we advise immediate action. Life Insurance is vital to your future and your family's welfare. Postal Life Insurance Company, 511 Fifth Avenue, New York 17, N. Y.

**Postal Life Insurance Company
511 Fifth Ave., Dept. D-530, New York 17, N. Y.**

Mail rates and full details about your "\$2.00-per-month", 30-Payment Life Policy at any age.

Name

Occupation..... Date of Birth.....

Address

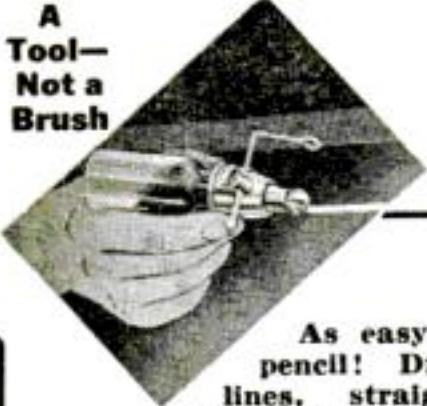
Include P. O. District Number, if any

PRINTING PAYS BIG

"Make your future secure. Prepare for a highly paid position or a print shop of your own. Students throughout the world are enthusiastic in their praise of our training program and the personal attention given each student. Rush name today for free literature and sample lesson. No salesman will call."

International School of Printing, Dept. 16, Troy, O.

A
Tool—
Not a
Brush



PAINTERS' STRIPING

TOOL

As easy to use as a pencil! Draws parallel lines, straight lines, curves, circles with paint, enamel, lacquer. Use to stripe autos, furniture, toys, bikes, model planes, signs, bulletin boards, linoleum. (Makes wall board look like tile) Every painter and craftsman should own one! Type "S" MASTER Painters' Striping Tool with instructions, adj. guide, 1/16" tip, complete only \$1.00. COD 25¢ extra. Order Today! Paint Dealers! Write for literature, etc.

WENDELL MFG. CO., 4234-A Lincoln Ave., Chicago 18, Ill.

ONLY
\$1.00
POST
PAID



A New Hobby!



COLLECT GENUINE
U. S. MILITARY
SHOULDER PATCHES



Make your den or lodge room the center of attraction with this fascinating hobby! Over 300 authentic military shoulder patches in stock, from 15c to 50c each! Send only 10c in coin for illustrated folder and price list.



MIDWEST SALES CO.

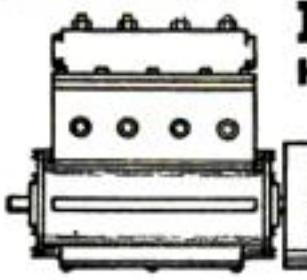
Dept. PS-1
P.O. Box 1092 Omaha, Nebr.

HOW MACHINES WORK?

This is an age of machines. It is not difficult to operate or understand a machine. This remarkable, compact encyclopedia, FUNDAMENTALS OF MECHANICS, is crammed full with the "how" and "why" of machinery . . . FIRST, it describes and explains such basic elements and ideas as:—atoms, matter, motion, liquids, gases, solids, density, energy, force, gravity, measurement, friction, gage, gears, heat, inertia, mass, momentum, tensile strength, temperature, volume, weight, etc.—THEN, it shows you just how machines of different kinds work, such as:—Automobile, Diesel Engine, Steam Engine, Pumps, Bombs, Hydraulic Press, Jet Force, Levers, Pulley, Screw, Wedge, Wheel, Movers, Pendulum, Rocket Ship, Thermostat, Block & Tackle, etc. etc. . . . This book lifts up the hood, and shows you simply just what happens! 40 CHAPTERS—188 PAGES—HUNDREDS OF ILLUSTRATIONS AND DIAGRAMS, plus formulas, tables and charts—to inform the beginner—and for the technician it is a reference book of value. THIS MATERIAL was used by army personnel in training its mechanics. Never before has such valuable data been available at such a low price. Send only 50c (check, coin or stamps)—no c.o.d.'s at this low price—and MONEY BACK if not satisfied!

HOBBY BOOK MART

150 Nassau St. Dept. F New York 7, N. Y.



MULTICYLINDER HI-SPEED MODEL STEAM ENGINE

Operates on steam, compressed air or other vapor at high or low pressures. Automatic valves runs either way. Specifications Bore 7/16" Stroke 1 1/2" Height 3 1/2" Length 4 3/4" Weight 17 ozs. No. Cyls. 4. Castings—aluminum copper alloy. Precision engineered—Easy to build. Rough Casting Set (finished crank) \$13.25 Complete Engine (as shown) \$22.75. Forward your order direct to . . .

INLAND MARINE COMPANY Webster Groves 19, Missouri.
7817 Grove Avenue

NEW 6 IN 1 CIG-SMOKER



AGENTS WRITE

IT'S A SENSATION—a scientifically designed Holder—Filter—Fire Shield—Ash Retainer—Smoke Cooler—and Automatic Snuffer Enjoy new thrills in safe, filtered cigaret smoking at Home—Shop—Office—Auto . . . IN BED. Prevents fires, burns, ash mess. Made of miracle, durable Silverglas. It's a beauty.

2 for \$1.00—Postpaid—12 for \$5.00
100 Filters Free 600 Filters Free
Pat. & Mfg., SAFE-GARD MFG. CO.
22 Perry-Payne Bldg., Cleveland 13, Ohio



PROPELLION

Real experiments. New power principle for boats, bicycles, autos, scooters, models, aero. Free circular SI BOSS,
2265 Warren, Toledo 10, Ohio

MAKE MONEY AT HOME

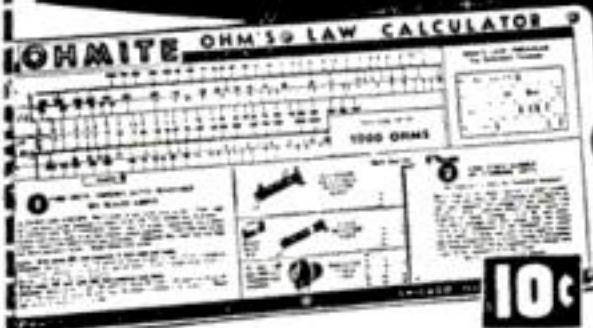
RUBBER MOLDS Low as 6¢ EA.

Amazing rubber mold-making outfit makes perfect flexible molds of plaques, ash trays, bookends, etc. Molds cost 6c to 25c each. Each mold makes hundreds of novelties and gifts to sell for \$1.00 apiece and more! No experience necessary. Everything furnished. Quick and easy. Start profitable business in your home—sell to stores, gift shops, friends, resorts, road stands, by mail. Full or spare time. Write for complete FREE details and easy instructions.

Solo Works, Dept. B-801, Loveland, Ohio



SEND FOR THIS
TIME SAVING OHMITE
Ohm's Law Calculator



of slide. All values direct reading. (4 $\frac{1}{8}$ "x9")

Send only 10c in coin to cover cost of handling.

OHMITE MFG. CO., 4942 Flournoy St., Chicago 44, Ill.

5-Power Vest Pocket TELESCOPE



\$1.47

This powerful little telescope is handsomely finished, constructed of genuine black plastic to withstand long and hard usage. No paper tubes. No paper or cloth covering. Has scientifically ground 33mm. lens, easy to focus; clear, wide vision. Length closed, 5-in., open 9-in. Excellent for indoor and outdoor events. Send \$1.47 and we'll pay postage. Try for 10 days. Return for refund if not completely satisfied. Rush Order—Supply Limited.

UTICA MAIL ORDER CO., 923 Eagle St., Utica 3, N.Y.

WHITTLER'S KIT

10 assorted soft white pine blanks—ready to whittle to the finished products. Also included an X-ACTO MODELLING KNIFE with complete instructions. EASY-FUN! Complete kit send prepaid for \$1.50. Write now to

OLD WHITTLER, Dept. PS-3, 1402 Charles St., LaCrosse, Wisconsin



FLIGHT JACKET INSIGNIA

With your own first name

Come and get 'em

50c

Post paid

Dress up your sweater, blouse, or lumber jacket and look just like the men that fly our big bombers. Indicate selection by number and print carefully your first name, or your nick name. Mail with 50c today. Agents Make Money—Take orders. Sell for \$1.00. Illustrated book of all Army Insignia Emblems only 25c.

INSIGNIA MART
703 Broadway, Dept. S New York 3, N.Y.

"WONDER" ELECTRIC BUTTON

Most interesting electrical apparatus ever discovered. Make your own Telephone-Amplifier Detectiphone. Transmit your voice or music to distant rooms. Perform hundreds of fascinating experiments. So tiny it can be concealed in dozens of places. Send \$1 now for button and free 5,000 word instruction booklet with 50 illustrated experiments. SPECIAL OFFER 6 buttons and booklets sent post-paid for \$5. Write now to

BUCK MFG. COMPANY North Aurora, Illinois

IF FALSE TEETH SLIP OR PROP

USE **REFIT MAGIC** → **PLASTI-LINER**

MAKES ALL PLATES **FIT PERFECTLY PERMANENTLY** **OR MONEY BACK**

ONE APPLICATION LASTS FOR LIFE OF PLATE

PLASTI-LINER is a professionally developed re-liner for home use that ends forever the mess and bother of temporary applications that last for only a few hours or a few months. It is NOT a paste, nor a powder; but a strip of genuine dental plastic!

SAFE AND EASY TO USE

PLASTI-LINER is non-toxic, pure, non-irritating, harmless, odorless, tasteless, smooth, molds to mouth. No heat necessary. Just 3 easy steps.

"Excellent Results" say users

"I bought your product over a year ago. Have had no trouble with my plates since. I have told my friends and now all of us with false teeth use PLASTI-LINER. It really works." Mrs. E. S., Brooklyn, N.Y.

FREE! Our competent staff dentist will answer all your plate problems.

SEND NO MONEY — ORDER TODAY

PLASTI-LINER CO. Dept. 32
617-619 Main St., Buffalo 3, N.Y.

Rush PLASTI-LINER with complete directions. I will pay Postman \$..... plus postage charges. I may return package for refund if I am not satisfied.

\$1 for UPPER or LOWER **\$2 for Both**

Name.....

Address.....

City..... Zone..... State.....

You Save Postage by Enclosing Money

YOU NEED THESE CRAFTSMAN'S TOOLS

SUPER DRILL GRINDER



70,000 NOW IN USE!

Grinds your drills like factory in 25 seconds. Gives perfect center and clearance. Saves drills, time and money. No shop should be without the Super Drill Grinder. Guaranteed to do the work or money back. The Grinder that gives a round point!

Only

\$2.95

SUPER ARBOR

(PATENT PENDING)

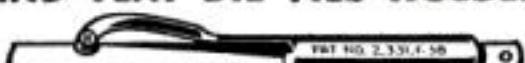
A combination drilling or grinding wheel attachment. For $\frac{1}{2}$ " motor shafts. Will take grinding wheel with 1" hole on shaft and $\frac{1}{2}$ " hole on small end. Extension can be used for rag or wire wheel, or $\frac{1}{2}$ ", 24-thread drill chuck which holds drills from No. 60 to $\frac{1}{2}$ " in diameter. Right hand thread only.



\$1.50

SUPER HACKSAW

AND FLAT DIE FILE HOLDER



The tool with 100 uses! Holds broken hacksaw blades—used by mechanics, electricians, plumbers, auto mechanics, hobbyists and repairmen. Perfect for all-round household needs; ideal for difficult close-quarter work. Nothing like it for tool and die men. Price, without saw blade.

95c

At your dealers or postpaid
Crandall Mfg. Company
1512 W. Slauson, Dept. FB-1
Los Angeles 44, California

GET THIS BOOK OF OVER 100 FUN and PROFIT ITEMS only \$1.50



WORTH \$12.35
IF PLANS BOUGHT
INDIVIDUALLY

SIMPLE PLANS for PRACTICAL PROJECTS

You will have no trouble in working out the plans detailed in the LeJay Manual and you will get a lot of enjoyment from them. Whether or not you are mechanically inclined, the projects in these plans will appeal to you for their usefulness and practicability. They will save you money and make money for you, too, in jobs and repairs for neighbors and friends, because the plans embody all kinds of electrical devices.

NO EXPENSIVE TOOLS NEEDED

The tools you have around the house are all you need for these projects and most of the necessary material can

be found around workshops, garages and scrap yards. Being able to make your own welder helps a lot in doing other jobs, and the LeJay Manual shows

you how easy it is to do this; also, how to make over 100 different items. . . . Sent on three days trial—money back if not satisfied. Only \$1.50. Canada, \$1.75.

THE NEW MODERN LEJAY

*FAST-FREEZER PLANS FROZEN STORAGE \$1.00

For Fish, Meat, Fruit,
etc. From 5° above
to 10° below zero.

5 SIZES—8 to 40
Cubic Feet Capacity

NO KNOWLEDGE OF REFRIGERATION REQUIRED

Plans are easy to follow and you may have much of the material at hand. FAST FREEZERS made from these plans have been in use since 1938.



MILK COOLER PLANS, too, are included at no extra cost. Send only \$1.00 for the FAST FREEZER plans—or save 25c and send \$2.25 for both these plans and the LeJay Manual.

BOTH **LEJAY MFG.CO.**
for only

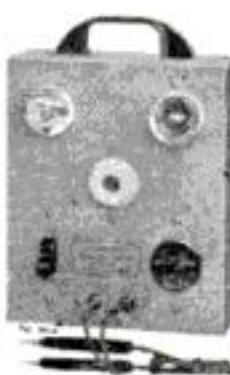
\$2.25 **723 LeJay Building**
MINNEAPOLIS - 8 - MINN.

ARMSTRONG TOOL HOLDERS

enabled American Industry to change to war production "over night." For they are the permanent, multi-purpose tools used by 96% of the machine shops and tool rooms, on lathes, planers and shapers—the tools used to make dies and jigs, to build production machines. They are the tools you will want for your own shop after the war—ARMSTRONG TOOL HOLDERS for industry, ACE Tool Holders for home work shops.

ARMSTRONG BROS. TOOL CO.

"The Tool Holder People"
328 N. Francisco Ave., Chicago 12, U.S.A.



LOCATES TROUBLE INSTANTLY
IN ALL ELECTRICAL DEVICES

HANLAN APPLIANCE TESTER

In this single unit are combined all the necessary tests for examining every appliance. Checks thermostats under actual working conditions. Tells instant it opens or closes. Controls the heat on soldering irons. Prevents over-heating. Tests continuity, open circuits, etc. Checks automatic irons, vacuum cleaners, motors, shavers, bulbs, appliances with 3-way switches, etc. Great time effort and money saver! ONLY \$9.50 COMPLETED.

FREE with each Tester. New, Complete Practical Course in electrical appliance repairing. WRITE FOR CIRCULAR.
HANLAN CO., 1419-B, West Jefferson, Los Angeles 7, Calif.



WHAT BOOKS DO YOU WANT?

We quote the lowest market prices. No charge for locating Hard-to-Find and Out-of-Print Books. All books, OLD or NEW, mailed POST-FREE.

SEARCHLIGHT BOOK CENTRE
22 East 17th Street
New York City

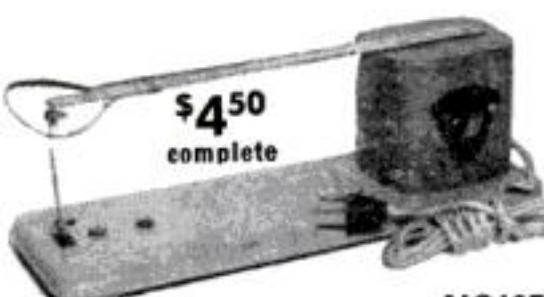
AMAZING MYSTERY BUTTON



Startles Everybody. With this Electronic Button you can make your own Telephone—Amplifier—Detectiphone. Attach this button to piece of cardboard—transmit conversation to another room. Music also transmitted to distant places. Most interesting electrical apparatus ever discovered. Enables you to perform hundreds of experiments. So tiny it can be concealed in dozens of places. A Pre-War Product. Electronic Button including 5000 word instruction booklet with 50 illustrated experiments postpaid only \$1.00. Electronic Products Company, Saint Charles, Ill.

When Writing Advertisers Please
Mention Popular Science Monthly

THE NEW THERMO-SAW



Cuts $\frac{1}{8}$ " or $\frac{1}{4}$ " stock by 110V. A.C. current through special transformer. Steel Nichrome blades. Size 11 x $4\frac{1}{4}$ x $3\frac{3}{4}$ will cut stock 14" wide and 36" long, without necessity of turning stock. No holes to drill. Working pattern included. Extra blades 20c doz. Simple and safe for children.

NOISELESS . . NO VIBRATION
NO SAWDUST . . SIMPLE PRINCIPLE

BOISSELIER MFG. CO.

GLEN ELLYN, ILL.
Enclosed find \$4.50 (\$4.75 for Canada and Foreign). Please ship postpaid complete Thermo-Saw, ready to plug in, with 12 blades and pattern. I have Alternating Current (A.C.) available.

WRITE NAME AND ADDRESS IN MARGIN BELOW



Navy men always choose AUTHENTICAST models of their ships. They use them in Recognition Training and they know AUTHENTICAST models are the finest ever built! . . . super-detailed to the Navy's precision specifications.

Build your own waferline models of famous American ships from AUTHENTICAST easy-to-build complete assembly kits: Aircraft Carrier Enterprise; Battleships Missouri (Iowa Class) and North Carolina Class; Cruisers Baltimore Class and Cleveland Class; Destroyer Sims Class; DE-51 (Buckley Class) — priced \$7.00 to \$11.00 at hobby shops. Official scale: 1 inch to 500 inches. See them all in the exciting 32-page AUTHENTICAST catalog — send 35c in coin for yours!



AUTHENTICAST
COMET METAL PRODUCTS CO., INC.
RICHMOND HILL 18, L.I., N.Y.

SCREWS NUTS, BOLTS, RIVETS, SPRINGS, WASHERS, Etc.



HUDSON TRADING CORPORATION

J1519 N. Wells Street Chicago 10, Illinois

CUT ANY SIZE HOLE IN METAL-WOOD-PLASTICS

Bruno Adjustable

Hole Cutter for home users,
mechanics, farmers, technicians!

High speed steel blade cuts clean holes
quickly. Fits drill press, portable drill or
hand brace. Money back guarantee! At all
hardware stores or write direct, Dept. PS-1

Model No. 100

\$2.95

Model No.	Shank Size	Cutter Expansion Capacity	User's Price
100	1/4" straight shank	5/8"- 1 1/2"	\$2.95
100-B	Square Bit Stock	5/8"- 1 1/2"	\$2.95
101	3/8" straight shank	1"- 2 1/2"	\$4.95
101-B	Square Bit Stock	1"- 2 1/2"	\$4.95

BRUNO TOOLS

Beverly Hills
California



Would you
pay me 2¢ if I
made you your
OWN BOSS!



↓ "I'm offering you 250 Money-Making Ideas for a business of your own"

Do you want to go into business for yourself? What type of business should you operate? How, When, Where should you start? Now—you have the chance to get the answers to questions like these.

OPPORTUNITIES TO SHARE

By A. C. CHAPMAN

At last! Here is your opportunity to get a practical, complete, inside guide that will equip you to act intelligently and confidently to become your own boss. Right from the start, point by point, this remarkable, easily understood handbook tells you how to avoid the pitfalls, gives all the do's and don'ts, questions and answers you must know to become independently successful. Tells you what decisions to make and how. Weighs your chance of success. Outlines how to start on limited capital and grow into a successful businessman. Gives stimulating ideas on businesses of the future. Chapter—"How to Finance a Business" alone . . . worth price of book.

TELLS HOW TO

- Finance a business
- Make money with a movie camera • Market your inventions • Make a success of the retail business • Start on the proverbial shoestring
- Take advantage of G.I. Bill of Rights • run many other businesses

Hundreds of POST-WAR Opportunities

Never before has such a concentration of tested, simple facts been offered to help the beginner start right, develop fast, and avoid common errors that cause 90% of business failure. It's helped hundreds and can help you. You haven't the time or experience to dig out information like this—expertly compiled, organized, dramatized. "Opportunities to Share" is ready now to work for you—but YOU MUST ACT IMMEDIATELY!

5-Day Trial Examination Offer

SEND NO MONEY. Mail name and address on a penny postcard. On delivery, pay postman \$4.98, plus C.O.D. charges. If you send cash we pay postage. Read and examine the book for 5 days. If by then you are not completely satisfied that it is the best investment you've ever made, return it and get your money back! If it can't help you, we won't let you keep it! DON'T WAIT! ORDER NOW!

The INVENTORS GUILD
2 East 39th St., Dept. 11,
Kansas City 2, Mo.

The INVENTORS GUILD, Dept. 11
2 East 39th St., Kansas City 2, Mo.

Please send me your 628-page book "OPPORTUNITIES TO SHARE" with the understanding that if not satisfactory, I can return it within 5 days of delivery and my money will be refunded.

Please send C.O.D. I enclose \$_____

NAME _____

ADDRESS _____

CITY AND STATE _____

WONDER PEN is Back!

Complete ELECTRIC Woodburning Outfit
BURN BEAUTIFUL DESIGNS in WOOD

Again available! The real thing! Finest quality electrically heated pen and all materials. Burn and etch deeply on wood in rich shades of brown. Achieve gorgeous effects by applying colors. Sandpaper and varnish to a fine finish. It's fascinating fun! Decorate your room or home. Make good money selling your own handiwork.

ONLY PEN WITH GUARANTEE 800 WORKING HOURS

Long life point and heating coils. Comfortable, cool cork grip. Standard 4½ ft. cord and plug.

DECORATE CORK, LEATHER, ETC. TOO

Make coasters, trays, highball jackets. Decorate belts, fobs, monograms. Create your own art pieces.

EASY TO LEARN

Full instructions. Use all-purpose point for lining, etching, shading.

ALL MATERIALS COMPLETE:

Guaranteed Electric Wonder Pen	4 Plaques Approx.
2 Plaques 6½ x 4½	3 x 4
4 Pcs Bookends 5 x 4	2 Paint Brushes
3 Plaques Approx.	6 Colors Paint
4½ x 4	Pkg. Nails
	2 Sandpapers
	Bottle Varnish

Ask for WONDER PEN at stores

or write
**AMERICAN
Toy & Furniture**
725 S. LaSalle
Chicago

Special!
New Assortment
of 8 different size
plywood plaques,
design imprinted.
In box.
Complete postpaid
\$1.25

ONLY
3
FOR
OUTFIT
Complete & postpaid



AGAIN! TOP VALUES

Universal Velocity Microphone—40,000 Imp.—25 ft. cable. Each.....	\$14.70
Army Headphone DC Resistance—17,000 Ohms.	2.95
Simpson Multi-range Output Meter—Model 427.....	10.95
Weston 3½ Rd. Meter—Model No. 476-9-150V AC.....	4.95
Mercury Model Z Selenium Rectifier Type—1½V & 90V	
Battery Eliminator.....	8.65
Dual Tr. I.F. Input or Output Transformers—455 KC. Each.....	.55

96" Car Aerials—Chrome plated—3 section—2 insulator side mount.	
Complete.....	3.78
Resistor Cords—All sizes—135 Ohms to 350 Ohms with plug.....	.45
560 Ohms and 960 Ohms with plug.....	.75
Universal Register Cords with plug.....	.70
Super Bargain—6 x 9 Oval Auto Speakers—4 Ohms—While they last...	.99
Brand New Astatic Crystal Cartridges—Type L50.....	2.35
Aerovox—.25 mfd 3000 V D.C.—2½" x 1¼" x 2¾" high.....	.99
Aerovox—4 x 4 mfd 600 V D.C.—2½" x 1¼" x 4¾" high.....	1.69

TUBES!

	TUBES!	TUBES!	TUBES!
01A.....	\$0.46	6K6GT.....	.54
1L4.....	.59	6H6.....	.61
1T4.....	.59	6J7.....	.72
1S5.....	.59	6K7.....	.54
3A4.....	.59	7H7.....	1.02
3S4.....	.59	12C8.....	1.10
6AG7.....	1.32	26.....	.41
6F6.....	.54	32.....	.72
6F6GT.....	.49		

TUBE ADAPTORS

USE:

354 to 1Q5	Each.....	.39
3A4 to 4½		
3A4 to 4"		
12SN7 to 2526		
6SL7 to 2526		

Order direct from this ad—or write Dept. PS-C1 TODAY for BIG FREE Catalog of HARD TO GET RADIO PARTS AVAILABLE NOW!

Our Terms are Cash. All C.O.D. orders must be accompanied with a deposit of 25% or more. We pay all shipping charges only on prepaid orders of \$25.00 or more.

Centrally Located to Serve the Nation

NATIONAL ELECTRONIC SUPPLY

622 West Kinzie Street

Chicago 10, Illinois

HOW TO MAKE A GOOD LIVING IN YOUR OWN SMALL STORE

► There's security, freedom and importance in owning a successful small store! This authoritative book, **A SMALL STORE AND INDEPENDENCE**, Practical Guide to Successful Retailing—written by two very successful retailers—shows you how to choose and operate a profitable small store, how you can at last be your own boss.

► This book tells you how much money you need; what business to consider; how to select a location; rent to pay; financing; records; advertising; displays; budgets; markdowns; salesmanship; merchandising policies, etc. Experts in varied fields of retailing have contributed sections covering stationery stores, home-furnishings, radio, paint, jewelry, fruit and vegetable, food stores, etc. Every page explains proved ways of making a success of a small store.

► Plan now to choose and set yourself up in a profitable business. **A SMALL STORE AND INDEPENDENCE**, by David B. Greenberg and Henry Schindall, shows you how. Clip coupon and mail today. If not satisfied, return for full refund.

Send no money unless you wish. Pay postman \$2.50 plus 22c postage and C.O.D. charges. If you send \$2.50 with order, we will pay all postal charges.



GREENBERG: PUBLISHER

406-J Madison Ave., New York 17, N. Y.

Send me **A SMALL STORE AND INDEPENDENCE** at \$2.50. If not satisfied, I may return it within 7 days for full refund.

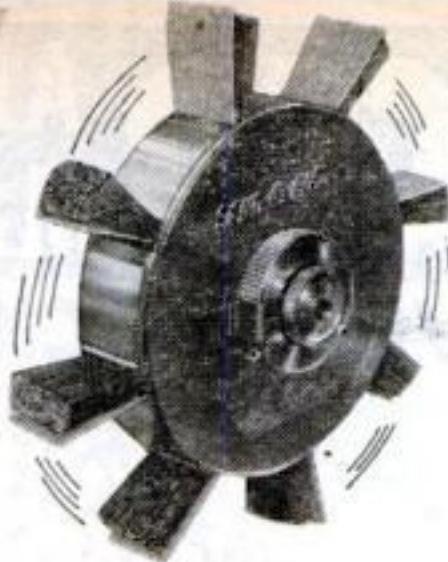
Payment enclosed C.O.D.

NAME.....

ADDRESS.....

CITY & STATE.....

FOR A
QUICK
FINISH—
USE THE
NEW



SAND-O-FLEX ALL-PURPOSE SANDER

Here is a low-cost sander that really reaches into recesses, around edges, and handles all those tedious jobs that were formerly done only by hand. Eight bristle brushes "cushion" the abrasive cloth and force it "down in" or "evenly over" all wood and metal surfaces. The central magazine houses the strip abrasive which is fed out as needed. Refill abrasive cartridges are supplied in various grits for all types of work. Loads in less than a minute. Weight 2 1/4 pounds. Diameter 8", including brushes. Slips onto your motor shaft and produces miracle finishes on curves and contours. See your dealer or write for catalog today.

SAND-O-FLEX CORPORATION

4373 Melrose Avenue • Los Angeles 27, Calif.

J. C. Larson

HANDI-CRAFTS HEADQUARTERS!

HEADQUARTERS!

Make Belts, Moccasins, Purses,
Gloves and other useful things

for profit

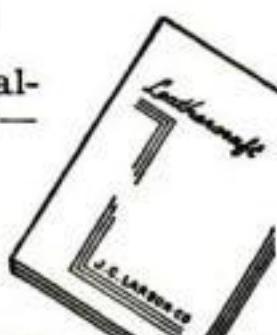
We have a fairly well balanced stock of leather—
tools and accessories.

Send 10c for catalog

J. C. LARSON & CO.

Dept. S

180 No. Wacker Drive Chicago 6, Ill.



"Radio For The Millions" Shows HOW TO BUILD 78 RADIOS— PHONOGRAPHS—OTHER SETS!

This giant book brings you 648 picture-diagrams plus complete instructions for building 78 radios and phonographs! Imagine! . . . 192 pages of step-by-step details on building an 8-tube FM set, a 2-way radio station, bicycle radio, floor lamp set, vest pocket portable, midget AC-DC set, superhet, high-fidelity amplifier, all wave receiver, home recorder, etc. What's more, there are scores of handsome cabinet suggestions, a dual turntable phonograph, tube tester and full details on "trouble-shooting"! So order now—send no money! When book arrives, pay postman only \$1.49 plus postal charges for regular edition, or \$1.98 for handsomely bound DeLuxe edition. If after 7 days' Free Trial you aren't delighted, return it for full refund. Write now to:

POPULAR SCIENCE, Dept. 16, 353 4th Ave., New York 10, N.Y.



THE TRUTH ABOUT SHAVING

For
PERFECT SHAVES use

- ① A Good Razor and Blade
- ② A Good Beard Softener
- ③ The Best Sharpener—to

Strop Blades
Before You Shave



See how TWINPLEX fits the hand—
holds and flexes blade at proper angle
and pressure—gives a barber-smooth
edge! Genuine strap-leather rollers. Just
turn the crank for smoother, cleaner
shaves. No skill required. Only \$2. See
your dealer for a demonstration today.

TWINPLEX MANUFACTURING CO., CHICAGO



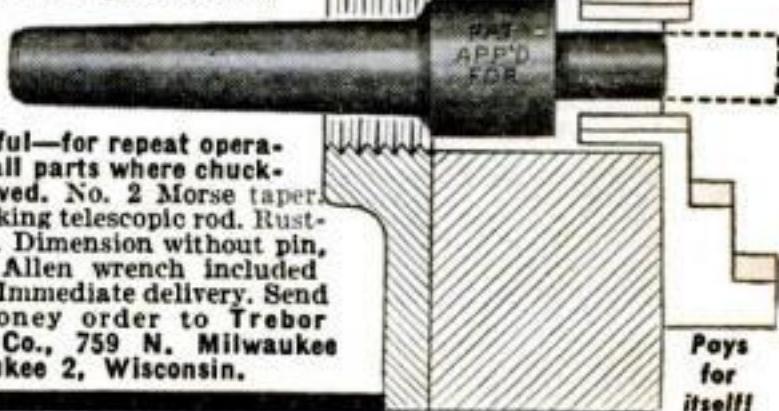
Adjustable Work Stop

NEW!
\$3.75
POSTPAID
anywhere
U. S. A.

simplifies chucking of
small parts . . . machining
to accurate lengths

—for lathes, milling machines,
dividing heads, etc.

Handy, useful—for repeat opera-
tions on small parts where chuck-
ing is involved. No. 2 Morse taper.
Positive-locking telescopic rod. Rust-
proof finish. Dimension without pin,
4" x 1". Allen wrench included.
Order now. Immediate delivery. Send
coin or money order to Trebor
Machinery Co., 759 N. Milwaukee
St., Milwaukee 2, Wisconsin.



A time-
saver!

Pays
for
itself!

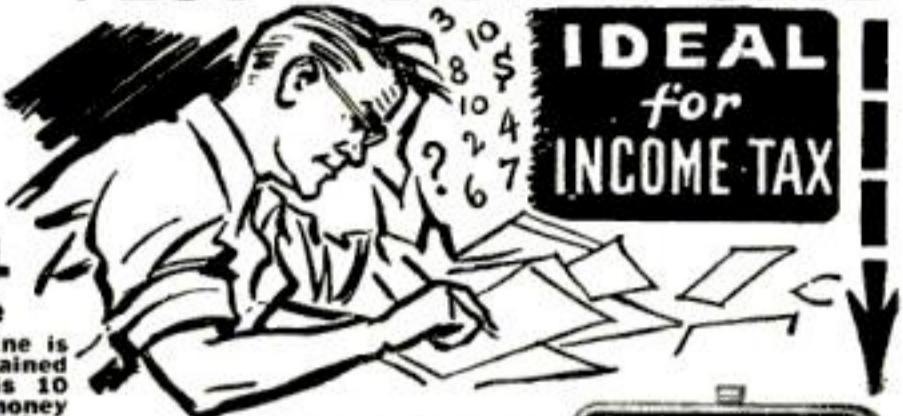
WORLD'S LOWEST PRICED ADDING MACHINE

VEST POCKET SIZE

IDEAL
for
INCOME TAX

Fits vest pocket or purse. Guaranteed Accurate. Operated as easily, and as reliable, as machines costing many times as much. NOT A TOY OR GADGET. Substantially made of 28-gauge steel—guaranteed for life against defects in construction. Beautiful looking, modernized design. Finished in Black, Silver and Red. You positively can't buy a Calculator of equal quality for as little money. ACCEPTED AS THE FINEST LOW PRICED CALCULATOR FOR OVER 30 YEARS! Operates with a flick of your finger. Adds, subtracts, multiplies, divides—counts up to ten million. Pays for itself over and over in mistakes avoided, and time saved.

**CALCULATOR MACHINE CO. (Mfrs.)
DEPT. 462, P.O. Box 1118, CHICAGO, ILL.**



TEN DAY TRIAL

Money Back Guarantee

Because we know that our machine is the very best Calculator to be obtained at this low price, we make this 10 Day Trial offer on a positive money back guarantee! Don't buy ANY Calculator without this guarantee! Send only name and address, pay postman \$2.50 plus postage (if cash is sent, we pay postage—you save up to 40c). (Send full cash if outside U. S.) Money back within 10 days if not delighted.

FREE TRIAL

ONLY

\$2 50

TOTAL COST

SEND NO MONEY

FREE!!



Each Baby Calculator enclosed in beautiful rich-looking Leatherette Case—at no extra cost.

★ Plastic STOCK & KITS ★

PLEXIGLAS SHEETS: New, per square foot, following thicknesses: 1/16" \$1.60; 1/8" \$2.00; 3/16" \$2.25; 1/4" \$2.75; 5/16" \$3.75; 1/2" \$4.75; 9/16" \$7.50; 1" \$9.50. 5% discount on orders over 5 square feet and 10% over 10 square feet. Other Plastic Supplies. PLASTIC KITS: \$2.00; \$5.00 and \$10.00 each. We pay shipping charges. Send Money Order to—

PLASTIC SUPPLY CO.

2618 St. Louis Ave. ★ ★ ★ St. Louis 6, Mo.



Fix Your Own —— ALARM CLOCKS

New, practical home course. Just out. Makes interesting hobby—profitable too. Save money by doing your own repairing at home. Easy if you know how. Price now only \$1.00. Details FREE. Send postcard.

THIES JEWELRY STORE, Genoa 5, Illinois

ART BOOK MAKES FIGURE DRAWING EASY!

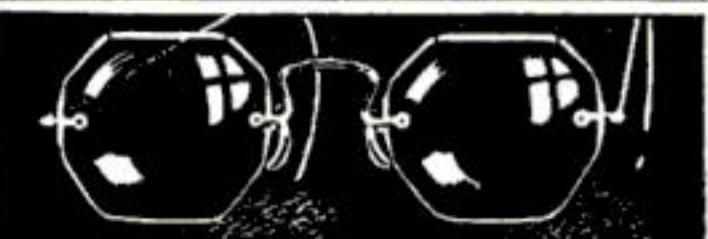


No you don't have to attend an art school or hire expensive artist models to learn figure drawing. This excellent Art Book is fully illustrated with a series of art models in full life poses. They are so posed that each part of the anatomy is clearly revealed to make sketching simple for the student. Send \$1.00 (No C.O.D.)

Merit Book Co. (Dept. P.S. 6)

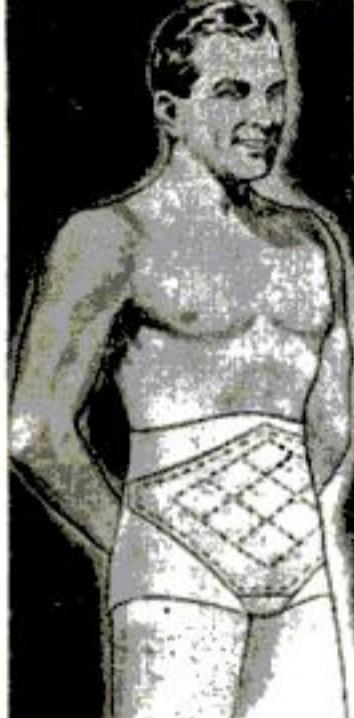
Box 21 Station A New York 12, N. Y.

EYE-
GLASSES
BY MAIL
16 Days Trial



Write Today for Free Catalog. Send no Money

ADVANCE SPECTACLE COMPANY
537 South Dearborn Street, Dept. SP 1, Chicago, Illinois



THOUSANDS of MEN NOW Appear FEEL Look SLIMMER BETTER YOUNGER with Commander

Now you can get sensational results—at once—with the new Commander Supporter. Stay slenderized with this amazing free-action, ever comfortable, elastic woven garment! Once you try it, you'll never be without the Commander!

"THE INTERLOCKING HANDS" The Sensational NEW PRINCIPLE OF Abdominal Support

Clasp your hands over the abdomen, as in the picture—then raise and press gently against it—and notice how much better you feel! Sturdy porous fabric is BUILT-IN with the special stretch weave of the Commander for EXTRA DOUBLE SUPPORT across the abdomen. Instantly the Commander flattens your "corporation"—BRACES YOUR BACK—Improves your appearance—Your clothes fit smartly—You look better, too. No binding, no riding, no sagging! Send for this famous all-purpose supporter belt today!

TRY IT TEN DAYS

At Our Expense

Do this today! Send the coupon—wear a Commander for TEN DAYS AT OUR EXPENSE—and if you do not get all the results you expect, return it and YOUR MONEY WILL BE REFUNDED promptly.

\$2 98



10 DAY FREE TRIAL COUPON—MAIL TODAY

Ward Green Company, Dept. L911,
113 W. 57 St., New York 19, N. Y.

Send me The "Commander" for Free Trial. I will pay postman \$2.98 plus postage. (Sizes 28 to 47.) If not satisfied after wearing 10 days I may return it for a prompt refund. (Sizes 48 to 60 \$3.98.)

My waist Measure..... My Height.....

NAME.....

ADDRESS.....

We pay postage if \$2.98 is included

This One



27C3-KCY-HEHK

IDEAL FOR Auto-Home Appliance and Farm REPAIRS

NOW A DYNAMIC HEAVY DUTY INDUSTRIAL WELDER

**AVAILABLE NOW
WITHOUT PRIORITIES! \$23⁵⁰**

Designed to Do High-Grade Welding Inexpensively

Maintenance men, farmers, mechanics, machine shops, foundries, auto, general repair and job welding shops using the DYNAMIC WELDER find it so indispensable and useful that they cannot afford to be without it. If inexperienced you can easily learn to do a variety of high-grade welding jobs by following the practical, simplified operating and welding instructions furnished.

WORKS ON IRON, STEEL, BRASS, BRONZE and OTHER METALS

Has eight metallic and carbon arc welding heat stages. Does work you would think only possible with a larger, more expensive machine.

READ WHAT USERS SAY...

Repair Shop Owner says, "It will do more than you say"

"I want to say I operate a repair garage and am more than satisfied with the welder. It will do more than you say." C. P., Butler, Ohio

It's the Greatest Portable Outfit

"Now I am equipped for all kinds of welding and I must say it's the greatest portable outfit for welding any man could ever wish to own. I wouldn't sell mine for the cost of plenty welders I have seen which were very high in cost but not in convenience. You may put me on file as a booster of your wonderful welding product." W. J. B., St. John, N. B., Canada

Better Than I Expected

"I have done quite a little welding with my welder and will say it is better than I expected. The price, convenience, and variety of work that can be done with the Dynamic are the attractive points." W. R. P., Portland, Ore.

EASY TO OPERATE!

DYNAMIC SUPERCHARGED WELDER

GET DETAILS ON OUR 10-DAY TRIAL OFFER!

Once you see a DYNAMIC in operation you won't want to be without it. Its simplicity will amaze you. In a year the DYNAMIC only costs you about 6c a day. Comes complete, ready to operate, with helmet, rods, cables, electrode holder and operating instructions, etc. Nothing else to buy. Write today for Free particulars. Act now and get details on our amazingly low priced Dynamic Welder and 10 day trial offer.



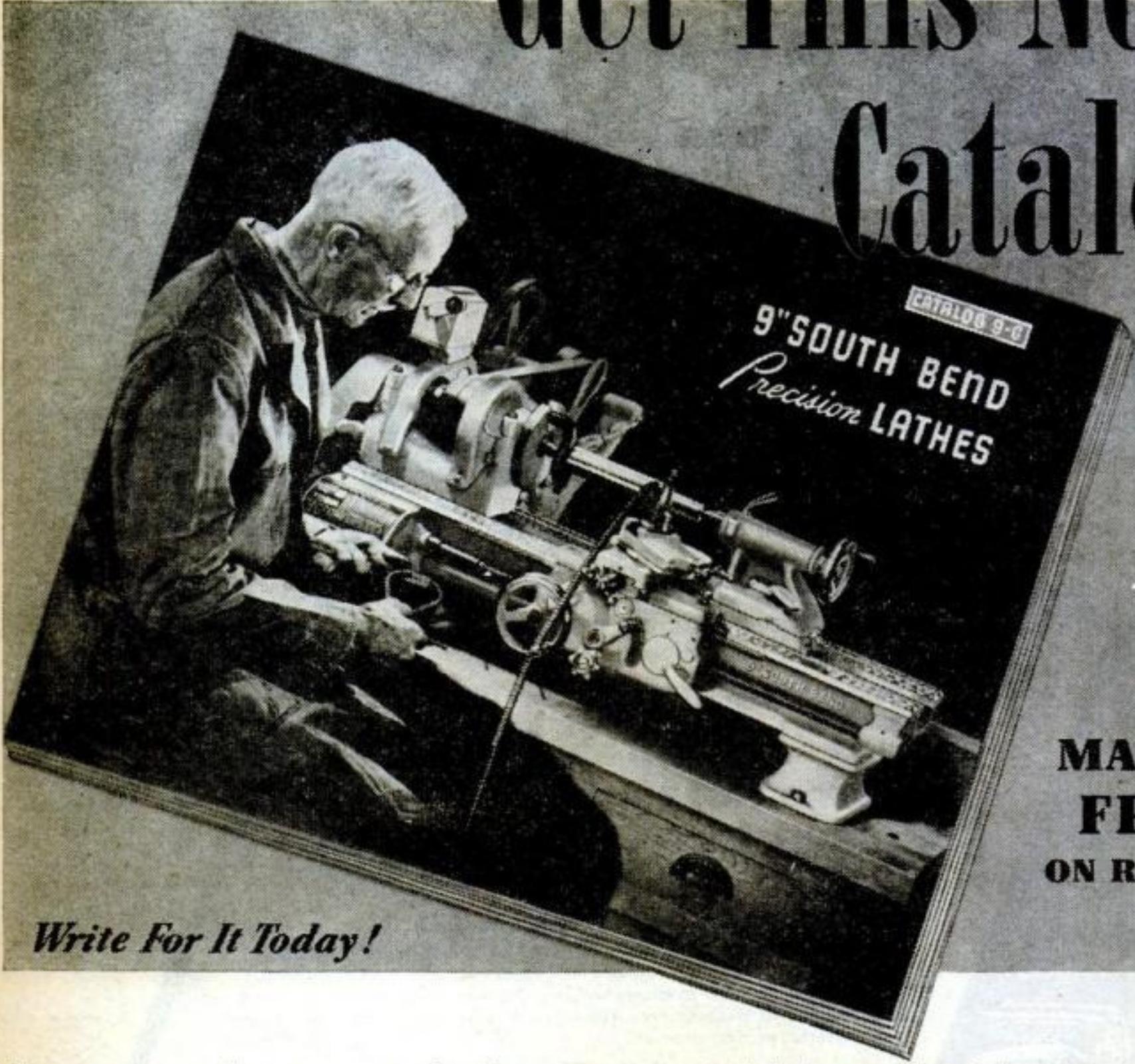
DYNAMIC WELDER CO.

13 East 23rd. Street—GA

CHICAGO 16, ILLINOIS



Get This New Catalog



**MAILED
FREE
ON REQUEST**

Write For It Today!

If you own a shop, or are planning one, you'll want this new thirty-six page catalog which illustrates the complete line of South Bend 9-inch Precision Lathes in full color. Each lathe shown in this catalog is a precision tool capable of machining metals, plastics, compositions, and other machinable

materials, to exacting tolerances and is ideal for use in experimental, model, laboratory, machine and repair shops, and for toolroom and production work. Prices start at \$110.50, less electrical equipment and bench, f.o.b. factory. Complete specifications, including capacities, speeds, feeds, and weights are listed, and attachments and accessories are also shown, in this catalog. Write for your free copy today!

LARGER SIZES OF SOUTH BEND LATHES

South Bend Engine Lathes and Toolroom Lathes also are available with 10", 13", 14½", and 16" swings. Precision Turret Lathes are made with ½" and 1" collet capacities. Information supplied on request. Please specify size of lathe in which you are interested when you request your catalog.



SOUTH BEND LATHE WORKS
LATHE BUILDERS SINCE 1906
456 EAST MADISON STREET • SOUTH BEND 22, INDIANA



Here's Easy High-Speed in all 25 Useful Br **Mathem**

—to help you qualify for
in America's expanding peacetime

Brought to You by 28 Leading Experts from Columbia, M.I.T., Cornell, Carnegie Tech., Georgia Tech., many others! A Practical Mathematics Course in Four Volumes! Used by Over 100,000 Men in Shop and Office!

LIMAXING its achievements in adult education, the NATIONAL EDUCATIONAL ALLIANCE now announces a new streamlined Course in Mathematics especially designed to answer the thousands of urgent peacetime calls for mathematically trained men in virtually EVERY field!

On work bench, in drafting room; in the laboratory; in tool die and pattern making; in construction and engineering of all kinds; there's hardly a field where a mathematically trained man hasn't a decided advantage. He gets the better job—bigger pay—earns promotion more quickly—and will come out head in America's change-over to peacetime industry.

This New N.E.A. Course in Mathematics makes it possible for the average person to acquire—in only a few months—a practical working knowledge of all 25 branches of mathematics and their practical applications. It comes to you complete in four volumes filled with illustrated fascinating lessons designed for home study.

You receive instruction from 28 foremost instructors chosen from outstanding universities. Each instructor has been selected because of his special knowledge of a particular branch of mathematics and because of his ability to simplify and streamline his instructions.

Over 600 Helpful, Graphic Pictures and Diagrams! Nearly 1300 Pages!

No previous mathematics knowledge is needed under this ingenious teaching plan. You start with Basic Arithmetic and proceed by easy stages to an understanding of the most advanced branches of mathematics.

You'll learn how to use Algebra for short cuts in daily shop problems, in construction work, in tool and die making, in welding, sheet metal work and pattern making, in office and laboratory. You'll learn how to apply Geometry in chemistry, mechanics, electricity and radio, in the drafting room. You'll learn how

to employ Trigonometry in gearing, lathe centers, blueprints, die punches, etc.; in range finding, aviation, navigation. You'll learn how to utilize Calculus in the design and production of ships, dams, bridges, motors.

You'll learn Practical Applications that you can use to win advancement and bigger pay, now and in peacetime.

Yours for FREE TRIAL

Normally, mathematical training as comprehensive as these 25-Courses-in-1 would cost you hundreds of dollars and years of study. Now you get it in these 4 volumes at a small fraction of the cost and time! Test this Course at our risk and expense. Mail coupon below—get the set for a week's FREE Examination. After a week you may return it and owe nothing; however, if you are thoroughly convinced that it can help you advance to bigger earnings, keep it at the incredible bargain price and easy terms shown in coupon. *But you must ACT NOW!* This edition is limited in quantity. There may not be enough to meet nation-wide demand. Avoid disappointment—mail Free-Trial Coupon NOW! National Educational Alliance, 37 W. 47th St., New York 19, N. Y.

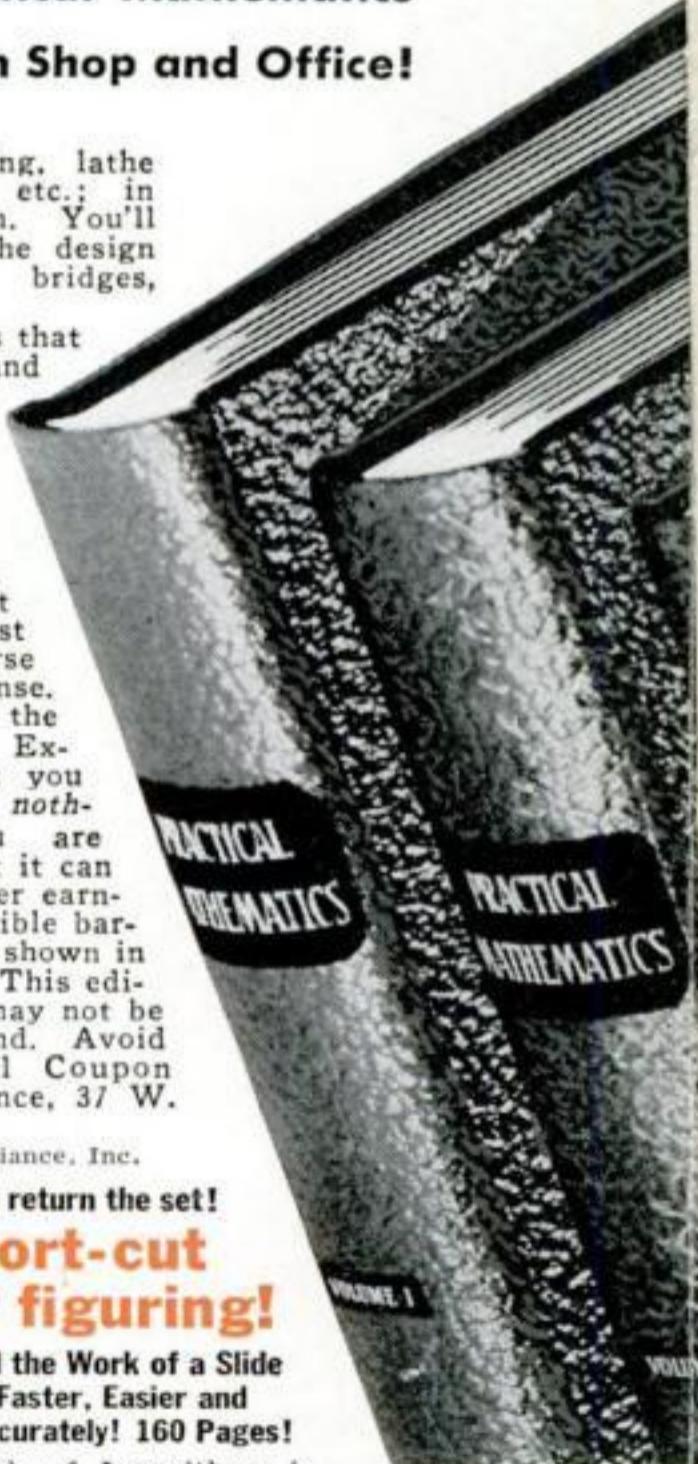
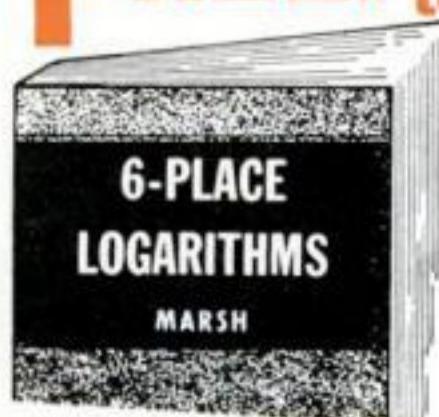
Copyright by the National Educational Alliance, Inc.

even if you return the set!

FREE! this short-cut
to easy figuring!

Does All the Work of a Slide Rule Faster, Easier and More Accurately! 160 Pages!

This book of Logarithms is the greatest short-cut ever devised for quick and easy multiplying, dividing and all other calculating. Easier to learn; gives answers quickly and more accurately than any Slide Rule. A complete explanation of the use of logarithm tables is given. So simple you can grasp it and begin to apply it in a few minutes. Covers logs for all numbers to the 6th place; contains much additional information including a table of circular arcs. Invaluable for mechanics, scientists, business men, etc. **FREE** even if you return the Mathematics Library



MAIL THIS FREE-TRIAL-FREE GIFT COUPON TODAY

Copyright 1941

it's radio!
it's theatre!
it's screen!

it's television!

And Loretta A. Brophy,
one of television's
leading program directors,
will tell you that with her
Camels are always in the picture



It's a song-and-dance team she's rehearsing here. Tomorrow it may be anything from a quiz program to grand opera. But to Director Loretta Brophy, of WABD—Dumont (seated above), it's all "fast, exciting, fun!"



"This is a take!" From her control room, Director Brophy (at left) gives the signal that telecasts the scene to you. And when she calls "Cut," that means the show is over ... But Camels are still in order (see right).

"The grand flavor and mildness of the tobaccos in Camels suit my 'T-Zone' to a 'T'"

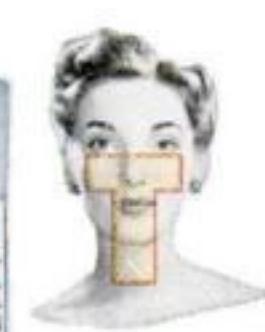
IF YOU'RE a Camel smoker you'll appreciate the words of Director Loretta Brophy when she tells of her experience during the late cigarette shortage.

"When I couldn't get Camels, I smoked anything I could get," Miss Brophy says. "That's when I learned really to appreciate Camels."

Now that Camels are again easier to get, more people than ever want Camels.

Costlier tobaccos

R. J. Reynolds Tobacco Co.
Winston-Salem, N. C.



The "T-ZONE" Test Will Tell You

The "T-Zone"—T for taste and T for throat—is your own laboratory, your proving ground, for any cigarette. For only your taste and your throat can decide which cigarette tastes best to *you* ... and how it affects your throat.

Camels